

# **National Ignition Facility Monthly Status Report— April 2000**



**May 26, 2000**

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## NATIONAL IGNITION FACILITY MONTHLY STATUS REPORT SUMMARY APRIL 2000

Project Name:	National Ignition Facility	Building No.	581, 681 at LLNL	
NNSA Line Item No.:	96 D - 111	Project Manager:	E. I. Moses	925-423-9624 925-423-2612 (fax)
Budget & Reporting No.:	39 DP 02 (PACE) DP 0213 (OPC)	System Engineer:	M. L. Spaeth	925-424-4940 925-422-4667 (fax)
Funding Source:	Weapons Stockpile Stewardship – ICF	Program Sponsor:	C. J. Keane	301-903-4323
Original Funding Year:	'96 (first quarter)	Construction Manager:	V. S. Roberts	925-424-3662 925-423-7588 (fax)
Project Summary Description:	The Project provides for the design, procurement, construction, assembly, installation, and acceptance testing of the National Ignition Facility (NIF), an experimental inertial confinement fusion facility intended to achieve controlled thermonuclear fusion in the laboratory by imploding a small capsule containing a mixture of the hydrogen isotopes, deuterium and tritium. The NIF will be constructed at the Lawrence Livermore National Laboratory (LLNL), Livermore, California as determined by the Record of Decision made on December 19, 1996, as a part of the Stockpile Stewardship and Management Programmatic Environmental Impact Statement (SSM PEIS).			
Project Justification:	The mission of the National Inertial Confinement Fusion (ICF) program is to achieve controlled thermonuclear fusion in the laboratory. This program supports the National Nuclear Security Administration (NNSA) mandate of maintaining nuclear weapons science expertise required for stewardship of the stockpile, testing of nuclear weapons effects, and the development of fusion power by providing a database for inertial fusion ignition. This mission was identified in the NIF Justification of Mission Need, which was endorsed by the Secretary of Energy. Identification of target ignition as the next important step in ICF development for both defense and nondefense applications is consistent with the earlier (1990) recommendation of the Department of Energy's (DOE's) Fusion Policy Advisory Committee, and the National Academy of Sciences Inertial Fusion Review Group. In 1995, the DOE's Inertial Confinement Fusion Advisory Committee affirmed the program's readiness for ignition experiments. A review by the JASONs in 1996 affirmed the value of the NIF for stockpile stewardship.			
Interfaces with Other Projects	The NIF is a key element of the Stockpile Stewardship Program. It will provide scientific data for secondaries and will complement hydrodynamic tests and material testing for primaries. The NIF will provide data to calibrate ASCI models.			
Risk Management:	The Systems Engineering group has been organized and chartered to identify and manage risk. Working Groups within this organization include Beampath, Flange to Flange (cleanliness), Alignment, Contamination Control, Laser and Target Area Building (LTAB) lighting, Test Plans, Activation, and Subsystem Design Requirement/Interface Control Document (SSDR/ ICD) Update.			
Execution & Acquisition Strategy:	<p>The model successfully employed to execute the Conventional Facility will be adapted for the Beampath Infrastructure Systems. This model relies on the services of an Architect/Engineer (A/E) for design and an Integration Management and Installation Contractor to assist in managing the complex interfaces during installation and the commissioning of construction contracts. The approval to proceed with the sole source solicitation was received from the DOE this month.</p> <p>The Acquisition Strategy for laser equipment will focus on the use of integrating contractors to the maximum extent possible to achieve the performance specifications and incorporate technology advances.</p>			



## Project Manager's April 2000 Progress Report

### Summary Status

Category	Last Period	This Period	Projected Next Period
Cost	Major concern	Major concern	Major concern
Schedule	Major concern	Major concern	Major concern
Technical	Satisfactory	Satisfactory	Satisfactory
Overall Project	Major concern	Major concern	Major concern

### NIF PROJECT MANAGER'S ASSESSMENT

#### OVERALL PROJECT ASSESSMENT

Major concern due to schedule and cost.

*Safety:* On Saturday April 29, 2000, while preparing the Ringer crane for operation at the NIF site, a mechanical malfunction was observed by the operator. He stopped work and consulted with line management. They agreed with the operator's assessment, and with the Livermore Emergency Duty Officer, implemented a precautionary evacuation of the area around the crane. DOE was notified of the situation. The crane was then placed in a safe condition. A crane maintenance vendor is inspecting the crane and a management team headed by the Beampath Infrastructure System Associate Project Manager is reviewing the documentation, crane history, and repairs to ensure that the crane is fully safe before reuse.

*Technical Status:* The general status of the technologies underlying the NIF Project remains satisfactory. The issues currently being addressed are (1) cleanliness for installation, assembly, and activation of the laser system by Systems Engineering working groups; (2) laser glass, where a second pilot run at both commercial suppliers is expected to confirm the mitigation steps identified in the first pilot run; and (3) operational costs associated with Final Optics Assembly (FOA) optics compo-



nents, where methods are being developed to mitigate 3 $\omega$  damage and to resolve beam rotation issues.

*Schedule:* The project completion schedule remains a major concern for the quarter. Completion of the Beampath Infrastructure System (BIS) design and award of the contract for the Integration Management and Installation (IMI) Contractor are on the critical path schedule. The procurement package has been reviewed with DOE Procurement and NNSA Project organizations. DOE HQ approved moving forward with the request for proposal (RFP) for the IMI on April 24, and LLNL procurement has requested the proposal for the BIS IMI Services contract.

The construction status of the Conventional Facilities at the end of March 2000 is 87% complete.

*Cost:* The NIF Project Total Project Cost (TPC) is \$1.2B. The Project has obligated 78% of the TPC funds. The remaining contingency is \$16.7M. Because of schedule delays and projected increases in the design, construction management, assembly, and installation of the system infrastructure, cost growth of the TPC is anticipated and will remain a major concern until the budget rebaseline process is completed. The cost estimates and schedules were reviewed with the Level 1 and 2 Baseline Change Control Boards (BCCB) in preparation for the Energy Systems Acquisition Advisory Board Meetings scheduled in early May.

#### April Rebaseline Activities

The NIF Project performed the following key actions in April to rebaseline the Project before June 1, 2000: (1) implemented and statused the NNSA-approved Rebaseline and Transition Period Implementation Plans; (2) defined various options to support the BCCB 1 and 2 reviews; (3) implemented contract activities to bring in industry to design, fabricate, and assemble the BIS in the form of engineering and a major IMI sole source contract; (4) continued the major external reviews of the Project; and (5) made significant technical progress in laser glass production, laser first-article procurements, and transport system demonstration.

*Project Rebaseline Planning:* The Rebaseline Plan lays out the integrated activities to achieve new procurement strategies to involve industrial partners in the beampath infrastructure and lays out the use of contractors to design, manufacture, and assemble laser systems using enforceable bid documents, as is currently done in the Conventional Facilities. Because of the delay of DOE/NNSA guidance,



development of the second option cost and schedules is behind schedule.

*Management Organization:* The NIF Project management structure has been reviewed with several external panels and with the DOE/NNSA at the Level 1 and 2 BCCB meetings. The approach has been presented to the Secretary of Energy Advisory Board (SEAB) and the NIF Programs Review Committee (NPRC) this month. It was provided for DOE/NNSA review in the Project Execution Plan draft update.

*Schedule and Cost Rebaseline:* The bottom-up rebaseline schedule (covering 24,000 activities) and cost estimate for the first of two completion options have been completed and presented to the Level 1 and 2 BCCB in April in preparation for the Energy Systems Acquisition Advisory Board (ESAAB) review. Updated Project Data Sheets, Baseline Change Proposals, and supporting information were provided to the DOE/NNSA for the BCCB reviews.

*Procurement Strategy:* LLNL proposed, and the independent Beam-path Infrastructure Advisory Committee concurred, that the BIS Integration Management and Installation contract be given to an industrial firm. DOE HQ has been briefed, and approval to proceed with the sole source solicitation was received from DOE HQ at the end April.

*Independent Reviews:* The NPRC, a major independent review committee formed to brief the Laboratory Director on the progress and issues of the NIF Project, held a two-day meeting on organization, NIF technical status, rebaseline progress, and management. The NPRC provides reports directly to the University of California (UC) President's Office and the DOE. A subgroup met in early April to review progress in target physics. The General Accounting Office (GAO) review of the NIF continued with individual interviews. The SEAB Task Group of independent industry and scientific experts to advise the Secretary of Energy met to review management changes, cost and schedule estimates for the go-forward work, risk management, and technical progress.

#### April Activities Highlights

*Site and Conventional Facilities:* The major work in the Target Building involved the completion of formwork/shoring installation and rebar placement for the Target Area roof slab. This roof concrete pour is presently scheduled for early May.

*Laser/Optics Systems:* Acceptance tests have been completed on the first amplitude modulation chassis (AMC) delivered by the vendor, who has proposed several possible options for improving performance



that may be incorporated into the remaining three units to be delivered on this order.

*Beam Transport Systems:* Integrated activities to achieve new procurement strategies to involve industrial partners in the BIS continued. DOE approval was obtained to initiate an RFP for the BIS IMI Services Subcontract from the selected contractor on a sole source basis. LLNL procurement issued the RFP.

*Integrated Computer Control:* The release of the Front-end Laser Control System software was completed and consists of controls for the master oscillator, preamplifier module, and input sensor package. The deployment includes integrated supervisor and front-end processor (FEP) controls, laser shot cycle coordination and shot setup capability, and triggering by the integrated timing system.

*Optics:* Both laser glass vendors are making excellent progress in their Pilot II laser glass runs. Hoya began their melting campaign on schedule, and Schott has begun shipping post-processed glass to the finishing vendor. The small optics production plan was completed in April. This included a revision to the procurement plan to incorporate the current strategy to procure the small optics in integrated packages wherever reasonable from a cost and risk standpoint.

*Laser Control Systems:* Twenty-six blocks of vendor-produced actuators for the wavefront control system have been received. Thirteen blocks—about 540 actuators—have been tested so far. They appear to be of very high quality; all but ten have passed all incoming inspection tests.

*Target Experimental Systems:* The first vacuum isolation valve for the FOA was received at LLNL. The production contract for the remaining 47 valves was issued to the vendor.

*Operations Special Equipment:* Four demonstrations of the plasma electrode Pockels cell (PEPC) insertion system were successfully performed. Each sequence was performed in the automated mode that will be used to install and replace the PEPC line-replaceable units (LRUs).

*ES&H and Supporting R&D:* Hoya completed a very successful edge cladding run, producing over 2200 slab equivalents of edge cladding. The yield was greater than 90%, exceeding expectations by about a third. The material has been accepted and shipped to the warehouse.

#### May Scheduled Activities

The major activities scheduled to occur in May are to (1) make presentations to the Pre-ESAAB and support the ESAAB review of the NIF



rebaseline cost and schedule estimates, (2) complete the cost and schedule rebaseline status reviews with DOE/NNSA HQ and present them to the Level 1 and 2 BCCB meeting preparing for the Level 0 BCCB (ESAAB), (3) obtain approval from the DOE HQ Procurement organization to proceed, allowing the IMI Contractor to prepare detailed submittals, (4) receive the first Frame Assembly Unit (FAU) top plate, (5) complete the CSP 13, Vessel Setting notice to proceed, (6) continue the Hoya Pilot II glass production pilot run (7) receive first-bundle vacuum and switch windows, (8) perform the spatial filter line insertion system test, (9) receive spatial filter tubes and end vessels from the vendor, and (10) complete the Ringer crane repairs.



## WBS 1.1 PROJECT OFFICE

### ACTIVITIES

**Project Office** The major Project Office activities were to: (1) implement the rebaseline plan by preparing the rebaseline schedule and cost estimates based on the DOE/NNSA-provided options; (2) participate in external reviews by the NPRC, SEAB, and GAO; (3) present Project data sheets, cost estimates, and schedules for the DOE-selected options to the Level 1 and 2 BCCBs; and (4) provide weekly, monthly, and quarterly status reports.

In the rebaseline activity, the Project provided input to the Level 1 and Level 2 cost review committee and then provided Project data sheets, cost estimates, and schedules for various options. These were reviewed in a series of meetings in preparation of an ESAAB meeting in early May 2000. The Project Office also updated the Project Execution Plan and reviewed drafts with the Director and Deputy Directors of the Office of the NIF Project.

Several external reviews occurred in the second quarter: (1) the NPRC reporting to the LLNL Director and providing input directly to UC met twice, to develop their charter and review management changes, rebaseline status, and technical progress and, separately, to assess the status of target physics; (2) GAO review of the NIF continued with individual interviews; (3) the SEAB Task Group of independent industry and scientific experts, advising on NIF procurement and engineering strategies, reviewed management changes, rebaseline options, and technical progress.

**Assurances** An update of the Construction Safety Program in anticipation of the upcoming IMI contract is in progress.

**System Integration** During April, the NIF Project emphasis was shifted from rebaselining activities to the core mission. A milestone was completed for releasing the NIF Global Network, which documents the locations of all the survey monuments. A serious effort began this month to link the 3D Computer Aided Design (CAD) design models with the optics and performance models. The goal of this effort is to assure that a consistent configuration is used everywhere. Finally, Gross and Precision Cleaning procedures have been completed and are in the releasing process.



Information Systems	<p>The web-based ECR form is in the process of being revised based on user comments to make it easier to use. The in-process work is available in a trial mode through the Information Systems home page.</p> <p>Four possible database management tools have been identified to replace Sherpa. These are Metaphase by Structural Dynamics Research Corporation (SDRC), Windchill by PTC, Matrix by Matrix, and possible third-party tools affiliated with Livelink by OpenText. Initial contacts have commenced with all companies and meetings with both PTC and SDRC took place. Meetings are planned with OpenText in May and Matrix in June, with a first-cut assessment expected by the end of September.</p>
System Performance, Mission, and Risk Analysis	<p>The performance models for the Injection Laser System (ILS) were updated, and sensitivity studies were completed this month. The model results were compared with the “50 shot sequence” test performed in 1999. Based on this study, the optics specifications vs. system performance are better defined, and the sensitivity to nonconformance is understood.</p> <p>A study was completed this month to investigate how to mitigate damage risks to the 1<math>\omega</math> laser optics and diagnostics due to back reflection of 3<math>\omega</math> light from the target. The study focused on four potential optical coatings in the transport mirrors that could reject the back-reflected light while transmitting the 1<math>\omega</math> and alignment beams. The study recommended changing the baseline coating and working with the vendors to conduct damage tests.</p>
FSD Integration	<p>A configuration management procedure for the drawing exchange process, which formalizes the process of dealing with off-site partners, has been drafted.</p> <p>A common process and platform was developed for incorporating Parson’s design models into a CAD model at LLNL, which will be used for interference checking. Some of the Parson’s design models have already been imported into the switchyard target area CAD model to help with the target chamber repositioning.</p> <p>An effort to develop a common database that can be used by the optical modelers (Code V), mechanical designers (Pro/E), and laser propagation modelers (Prop 92) was started. This process will assure a common definition of the optic position and beam size as the beam transverses the system. The first milestone of a common database between the Code V and Pro/E models is scheduled for July.</p>



A budget for the allowable synthetic air leakage in the laser bays was developed. This budget documents the limit that meets the personnel safety requirements. This budget will be allocated to each of the groups that have a mating surface in the synthetic air-filled sections of the beamline.

#### System Alignment

The NIF Alignment Working Group was constituted this month for the purpose of reviewing NIF component and beam alignment issues. Their charter is to help ensure that the NIF is assembled and activated to meet the system alignment and design aperture requirements.

A review of the 3-mm network shoot, including survey experts from Stanford Linear Accelerator Center, was held. The survey and data reduction processes were reviewed, and the results were documented in NIF-0046723, completing the DOE milestone. The TCC Global network still needs to be released, which, due to target area and switchyard settling, will require an Engineering Change Request (ECR).

A strategy for moving the target chamber to its final position was developed. The first step is to test the jacking system, which is planned for mid-May.

#### Contamination Control

Initial testing of Dycem, Ltd and Teknek sticky rollers indicates that these solid adhesive rollers are highly effective for removing particles from metal surfaces. Visibly dirty surfaces could be cleaned to below Level 83 after only three passes with the sticky rollers. Experiments are continuing to determine the amount of nonvolatile residue (NVR) contamination remaining after roller cleaning a surface.

All reviews of MEL99-009-OA Gross Cleaning and MEL00-016-OA Precision Cleaning were completed, and the documents are about to be issued through PDM. These documents incorporate all of the latest knowledge on stainless-steel passivation and were written to merge all previous cleaning procedures into two small and compact technical cleaning procedures.

The clean connection methodology for enclosures was summarized in “Flange-to-Flange Working Group Presentation on Clean Beampath Infrastructure System Installation” and presented to CSP review teams from LLNL, Jacobs, and Parsons. A meeting on the clean construction of CSP14 and CSP15B utility piping systems was held with Applied Mechanical, Inc.



Configuration  
Management, Change  
Control Actions

The following tables list the formal actions completed by the Level 4 Change Control Boards during this month. There were no Level 3 Baseline Change Control Board actions.

In two meetings, the Level 1 and 2 Baseline Change Control Boards reviewed cost and schedule for various options.

Level 4 Change Control Board Actions:

ECR	Title	Resolution	Cost
1439	PEPC Support Structure LRU Opening	Approved	75K
1444	Spatial Filter Vacuum System (U220) Baseline P&ID	Approved	0
1445	Synthetic Air System (U300) and Amplifier Cooling System (L133) Baseline P&ID	Approved	0
1446	Tempered Water System (U150) Baseline P&ID	Approved	0
1517	Relocation of PASS Area Electrical Panels	Approved	88K
1742	Expansion Of WBS 1.8.4	Approved	0
CTR	Title	Resolution	Cost
354	FOA Vacuum Isolation Valve – Cost for Additional Weight of Casting	Approved	66K

The current contingency log is attached.

**PROBLEMS/IMPACTS/  
CORRECTIVE ACTIONS**

The Project needs guidance on the second option from DOE/NNSA to complete rebaselining. The Project needs immediate guidance on rates retroactive for FY00, or a \$2.0M impact will occur.

SDRC purchased Sherpa in January 2000. The reason for the purchase was to obtain Sherpa's customer base and software development staff. SDRC has announced that Sherpa has a one-year life. SDRC makes an equivalent product called Metaphase; their goal is to migrate all Sherpa customers to this product. Metaphase has some disadvantages; it does not support Macintosh computers very well, and the program touted for transferring and managing legacy data has been announced



but is not available until July 2000. Equally important is that Metaphase does not support concurrent licenses in the same manner as Sherpa. Today, the NIF Project has about 600 Sherpa users on 30 concurrent licenses. A significant cost will be incurred, \$400K to match the licenses to named users. A kick-off meeting was held on SDRC's process of discovery and analysis. SDRC will visit LLNL in late May for two days for an analysis of how Sherpa is used at LLNL and to determine what licenses will cost for equivalent functionality. SDRC is offering additional/new licenses at a 70% discount.

In anticipation that Metaphase may not be the correct answer for the NIF, three other alternatives are being investigated.

**PROCUREMENTS**      None.

**VARIANCES**      The rebaseline process has not been completed, and therefore, there are currently no variance statements for FY00 cost or schedule.

Note: The Estimate at Complete (EAC) has been revised to reflect the project level of Cost and Cost and Commitment at year end. The budget to cover the substantially increased System Engineering will be revised when FY00/01 Cost Account Plans (CAPs) are authorized at the conclusion of the rebaselining.

**UPCOMING MAJOR  
ACTIVITIES**

In May, the following will be accomplished:

- Incorporate the DuPont recommendations into the Construction Safety Program and issue the update for management approval.
- Complete the cost estimate and schedule for DOE/NNSA-selected deployment options, (see Problems re: the second option and the causal beneficial rates).
- Submit the rebaseline Project data sheets, cost estimates, and schedule and support the ESAAB decision on the Option to be implemented (e.g., cost estimate, schedule).
- Obtain DOE/NNSA review of the Project Execution Plan update draft.
- Have SRDC review the use of Sherpa at LLNL.
- Begin the jacking tests as the first phase of moving the target chamber to its final position.
- Report on the preliminary results from the laser performance sensitivity studies. These studies investigated the impact of optics quality in the ILS system on the 3 $\omega$  beam contrast ratio.



## **WBS 1.2 SITE AND CONVENTIONAL FACILITIES**

**ACTIVITIES** Conventional Facilities work reached 87% completion in April.

Site work for the month of April continued with the placement of the remainder of both the communication and electrical ductbanks and the backfilling of the vaults along the northwest of the site near Switchyard 2.

Progress in the Laser Building included the completion of masonry work and heating, ventilating, and air conditioning (HVAC) installation for the Visitors Center structure adjacent to Laser Bay 1. In Laser Bay 1, the taping of drywall continued. The remaining high work continued, which includes the installation of ceiling system, light fixtures, and fire sprinklers above the temporary platform at the west end. Finishing of the pedestals in Laser Bay 1 is complete. Structural framing for the rails of elevator 1 is complete. In Laser Bay 2, Pentagon (the precision-cleaning subcontractor) completed the cleaning of the return air plenums, and the preparation of the concrete floor for the epoxy coating is complete. In the Laser Building Core Area, the installation of the raised floor and T-bar ceiling grid is complete in the Control, Strategy, and Computer Rooms.

The installation of ductwork and various utilities in the Class-100 Preamplifier Module Maintenance Area (PAMMA) clean room is complete. The installation of electrical conduits from the switchboard to the elevated panels continued in the Capacitor Bays. Roll-up doors, stud framing, and some sheetrock continued in the OAB corridor, along with work on the HVAC system in this area.

Pipefitting and electrical work continued on the Mezzanine levels. Work continued on the AHUs for Laser Bay 2 and the PAMMA areas.

The major work in the Target Building involved the completion of formwork/shoring installation and rebar placement for the Target Area roof slab. This roof concrete pour is presently scheduled for early May. The Target Building also showed progress on the various levels (-21.75', 17.50', 50.50', 69.75') with the installation of pipe/conduit supports, mechanical utilities, stainless-steel vacuum lines, fire sprinkler piping, and the electrical conduit. During this period, the installation of collimators continued at level -33.75'.

Work in the Diagnostics Building included the continuation of metal stud framing and drywall; continuation of mechanical ductwork, restroom plumbing, mechanical utilities, and electrical rough-in on various levels; continuation of wood nailers and weldout of upper duct



run on elevation 50.5'; and continuation of liner panel siding on the elevator shaft. During this period, the installation of the exhaust stack was completed.

The mechanical and electrical work associated with the Switchyard 2 platform at elevation 70' continued. The installation of fire protection piping is complete. The drilling of epoxy dowels and the installation of rebar for the Switchyard 2 HVAC equipment pad continued. The preparation of Switchyard 1 concrete surfaces for EIFS installation also continued.

All punchlist repair work in the OAB is fully complete. Final Acceptance by the Project occurred on April 28, 2000.

On Saturday April 29, 2000, while preparing the Ringer crane for operation at the NIF site, a mechanical malfunction was observed by the operator. He stopped work and consulted with line management. They agreed with the operator's assessment, and with the Livermore Emergency Duty Officer, implemented a precautionary evacuation of the area around the crane. DOE was notified of the situation. The crane was then placed in a safe condition. A crane maintenance vendor is inspecting the crane, and a management team headed by the Beampath Infrastructure System Associate Project Manager is reviewing the documentation, crane history, and repairs to ensure that the crane is fully ready before reuse.

**PROBLEMS/IMPACTS/  
CORRECTIVE ACTIONS**

Congestion on the west site continued in April due to the installation of underground sanitary sewer and electrical ductbank near the Switchyard 2 area that required close coordination between the CSP-9 and CSP-6/10 subcontractors.

The progress on the installation of the Switchyard 1 steel structure is slowed by the loss of the Ringer crane on Saturday, April 29.

**VARIANCES**

The rebaseline process has not been completed, and therefore, there are currently no variance statements for FY00 cost or schedule.

**UPCOMING MAJOR  
ACTIVITIES**

- The placement of Target Bay roof slab is projected for completion in early May.
- Place SY2 roofing and insulation in May.
- Repair and resume use of the Ringer crane in May.



## WBS 1.3 LASER SYSTEMS

### ACTIVITIES

#### Optical Pulse Generation System

For the master oscillator system, assembly and design of the first production double-pass fiber amplifier (DPA) chassis was completed. This unit featured several improvements over the first-article and achieved the required output power at roughly half the rated pump diode current.

Work has now started on assembly of the first production fiber-oscillator chassis utilizing the recently received fully integrated, distributed feedback fiber laser optical circuit assemblies from Ionas. The manufacturer's tests indicate consistently 25 to 50% higher power output than from the previous versions, which will assure that the NIF requirement for the chassis is met and will reduce the high-frequency noise contributions from amplified spontaneous emission in the double-pass amplifier. It is expected that the first-article fiber-oscillator chassis will be replaced in the integrated test facility with the production unit during May.

Acceptance tests have been completed on the first amplitude modulation chassis (AMC) delivered by Highland Technology. Highland has proposed several possible options for improving performance that may be incorporated into the remaining three units to be delivered on this order. Work has now started on developing the computer algorithm needed for the AMC to generate arbitrary waveforms.

The prototype pre-amplifier module (PAM) hardware is being prepared for the upcoming front end integrated system testing. Changes to the safety system have been completed that will allow for remote operation. Vacuum relay telescopes have been assembled using the procedure that was developed for the PAM procurement. Changes to the procedure are being documented. The new power conditioning unit has been relocated to the PAM lab and will be tested using the prototype PAM after a safety note and Integrated Worksheet (IWS) are completed.

The latest version of control software, which will be used for the integrated testing of the PAM and master oscillator system, was released. This release contains the capability to control or monitor most of the master oscillator system equipment, the PAM, and the input sensor package with its associated instruments. Timing control and rudimentary shot control is also available in this release. The integrated soft-



ware will be independently tested in May. Installation of the private controls network in the B381 labs, needed for the integrated tests, began this month. The fiber cabling from the distribution rack to rooms 1532, 1556, and 1560 was completed. Network routing equipment will be installed in May.

**Amplifier Assembly**

The flashlamp window assembly area for the amplifier was activated, including the meniscus coating system. Test runs began on the hardware prior to beginning production in May. Two FAUs were connected together on the alignment rails in the B381 Amplifier Assembly Facility to perform form and fit tests on the FAU and seal plate hardware.

**Amplifier Power  
Conditioning System  
(PCS)**

Orders were placed for the rack and buswork for the prototype module being built for reliability and performance testing. Delivery is expected in June. The output cables and cable trays for the electrical test into the FAU were installed in the 391 basement.

**PROBLEMS/IMPACTS/  
CORRECTIVE ACTIONS**

The first deliveries of the breadboards for the Pre-Amplifier Beam Transport System (PABTS) were received from both subcontractors. Due to the serious slip in schedule from the original vendor, a second vendor, TMC, was selected to replace one-half of the original contract with Kinetic Systems Incorporated (KSI). One month into this new contract, TMC is in the production mode producing 6 units a day. Production from KSI continues to be slow and is being closely monitored. As intended, the change to two subcontractors on this job has reduced the potential impact on CSP-13 considerably and has provided further assurance that the Building 381 risk mitigation activity will not be compromised for lack of breadboards.

**PROCUREMENTS**

For the Faraday rotator contract, key deliverables have been submitted by the subcontractor for LLNL review. These include: the project management plan, cleanliness plan, and project schedule. A preliminary design review package for the rotators and for the acceptance test workstation were also submitted.

Award of a contract to install a two-bundle version of the pre-amplifier support structure (PASS) in Bldg. 381 for our risk mitigation activities was made to Christie Constructors. Work is proceeding.

Many components for the assembly of FAU buses arrived in April. The first 3-long FAU was delivered by GTC, and the parts are now on-hand to complete assembly of the first FAU bus. The first end-isolators and



FAU seal plates were also received. The first article 2-long top-plate was completed at Everson and will be sectioned for inspection in May. Everson also made the first attempt to cast the amplifier cooling air manifold (Big-T) and had problems with the epoxy fill system, which they expect to solve with an attempt in May. Contracts were awarded for the Big-T gas seals and for the aerosol purge hardware above the amplifier.

A draft of the statement of work for the Power Conditioning System Procurement was sent to all interested vendors for comment. Comments were due by the end of April. In addition, initial visits to all interested vendors have been completed. Thirty production power supplies were shipped by General Atomics to American Controls Engineering for acceptance testing.

Sixty production capacitors were received from General Atomics. Acceptance testing is beginning immediately. Each capacitor will be tested for 500 shots to detect fabrication/assembly problems. In addition, a random capacitor will be selected for life testing.

**VARIANCES**      The rebaseline process has not been completed, and therefore, there are currently no variance statements for FY00 cost or schedule.

**UPCOMING MAJOR ACTIVITIES**

- Expect responses to the first-article PAM RFP from potential vendors on May 15.
- Continue cost estimating, detail budget planning, development of CAPs, and overall project rebaseline planning.
- Complete “dirty” assembly and transport of the FAU bus.
- Commission the FAU assembly clean room.



## WBS 1.4 BEAM TRANSPORT SYSTEMS

**ACTIVITIES** Integrated activities to achieve new procurement strategies to involve industrial partners in the Beampath Infrastructure System (BIS) continued. DOE approval was obtained to request a proposal for the BIS Integration Management and Installation Services (IMI) Subcontract from Jacobs. LLNL procurement issued the request for proposal.

### Spatial Filter Vessels/ Enclosures

*Spatial Filters:* Delivery of all four Transport Spatial Filter center vessels from STADCO was completed. Fifteen of 16 Spatial Filter end vessels from Ranor have been received. The last one was shipped from the vendor April 26 and is expected at LLNL the week of May 8. This will complete Spatial Filter vessel deliveries. By the month's end, 174 of 192 rectangular beam tubes had been shipped, with delivery completion expected in mid-May. The remaining rectangular beam tubes have completed fabrication and are being inspected and cleaned.

Fabrication of the spatial filter connector tubes began at SyncroVac. The initial shipment of tube stock from their supplier was rejected due to out-of-roundness. These tubes, coupled with SyncroVac's manufacturing plan, would not produce assemblies that would meet specifications. SyncroVac is modifying their fabrication procedure and has ordered replacement tube stock. They will supply a new schedule detailing the impact of the unusable tube stock in early May.

Hyspan is nearing completion of the new first-article of the tower kinematic mount bellows with inspection planned in early May. A previous first article test failed due to a bellows weld leak. Hyspan submitted a passivation estimate of \$65 per part, and an ECR will be prepared.

*Laser Bay Interstage Enclosures (LBIE):* The RFP for the LBIEs was released in March with the bids received April 14. Vendor selection and award of the job is expected in mid-May.

*Interstage Docking Frames (ISDF):* Major Tool is expected to ship Units 6 and 7 the first week of May with an expected receipt date of May 10. This will complete 100% of the first cluster and 75% of a second cluster. An ISDF was successfully fit-up to an end vessel confirming the design interface between the two units and also providing confidence in the P-Gasket installation strategy. Major Tool had previously filed cost claims with LLNL for a delay created by ECRs in November 1999. After reviewing the claims (totaling over \$400K), CTR1852 for \$208K was approved by the CCB on April 28. ECR1841



to improve the gasket light shield design on the ISDF was also approved.

To facilitate the different procurement strategies (target area build-to-print and Laser Building [LB]/switchyard [SY] design-and-build), the target area bellows order was separated from the LB/SY bellows order. Orders have been placed for prototype bellows made from Silicone, Teflon, Viton, and stainless steel. The bellows production order procurement review is scheduled for early June.

*Enclosures Dielectric Break:* The beampath dielectric break design team has selected Macor as the material of choice instead of the previously selected Delrin.

*Switchyard (SY) Enclosures:* Eighty-three straight enclosures were fabricated during April, bringing the number of completed enclosures to 133 (37% completion of the order). The last 49 enclosures needed for SY 2 will be completed before the end of May. LM4 and 5 elbow designs should be essentially complete, except for some detailing, by the end of May. The design for the SY elbow supports is about 60% complete.

*Ghost Mitigation:* An RFQ package for the remaining beam tube ‘megaphone-style’ ghost mitigation hardware was issued in mid-March.

*Roving Mirror Diagnostic Assembly (RMDA), Optic Mounts, and Gate Valve:* Preliminary stability analyses showed that dual sets of kinematically supported structures (bundle-sized structures and individual LRUs) were problematic with respect to meeting stability allocations. The design team determined that the LRU mount design could incorporate the adjustments required as part of the original kinematic mount system (KMS) support system. An agreement was reached to rigidly mount the KMS to enhance stability performance. An ECR will be written to cover the design change. A preliminary concept for a revised support system is currently being analyzed. Support redesign (for GFE hardware) is not anticipated to be a substantial effort.

The design of the switchyard gate valve is now about 80% complete. Detailing of the design has been under way for about three weeks. The procurement plan and schedule have been established. The current design package was submitted for Value Engineering Team review.

*Subassembly and Preparations of Government Furnished Equipment (GFE):* At the end of April, 14 of 16 spatial filter end vessels, 4 of 4 CSF center vessels, and 2 of 4 transport spatial filter (TSF) center vessels had been assembled and precision cleaned. CSP-12 pre-installation



tion work continued on the remaining spatial filter end vessels and TSF center vessels in preparation for precision cleaning. Assembly work on spatial filter center vessel pinhole tower support tables was begun. An acid etch and cleaning test on rectangular beam tube bundles determined that the current phosphoric acid gel etch method does not produce acceptable results. An alternative nitric acid dip etching proved effective and will be recommended for these bundles.

#### Support Structures

*Laser Bay Structures:* Concrete placement and painting is complete for all Laser Bay 1 & 2 concrete pedestals. The contractor and ATT Metrology have surveyed the penetrations at LB2 TSF center vessel concrete pedestals and found many to be out-of-tolerance. Thirteen worst cases of out-of-tolerance penetrations have been repaired by core drilling out the steel sleeve. This does not affect the construction schedule.

An ECR to clad the interior aluminum flame-sprayed surfaces of the Periscope and LM1 support structures with stainless-steel sheet was presented to the Level 4 and Level 3 BCCBs in mid-January. Following design completion and formal review, the RFB was issued for the contract on March 22. Six vendors attended a bidders conference at LLNL on March 30. Bids were received in mid-April, and a recommendation for a split award to three vendors was forwarded to the Contract Review Board (CRB). Contract awards are pending the CRB review in early May. Total initial award costs are more than 10% below the original ECR estimate.

Rework of the PEPC support structure has been completed at Martinez & Turek. It was necessary to enlarge the LRU openings to allow insertion of the PEPC LRU into the structure. Without enlargement, the original openings, after stainless-steel cladding, would have been reduced to the point of interference.

Process Equipment has welded 6 of the 24 periscope bottom-enclosure plates. These frames were stress relieved, and a skim cut was taken on the first article. There was negligible distortion from this operation. Final machining of the first article will begin in May. This fabrication is one month behind schedule but does not affect the construction schedule.

The LM1 support structure, fabricated at Olympic Tool, has been delivered. All units have been accepted. This concludes the LM1 contract with Olympic Tool.

Laser Bay PASS trolley beams have been completed and delivered by March Metalfab.



*Switchyard Structures:* AGRA Coast has completed the fabrication of all of the major components required for SY 1. The primary effort has been to answer RFIs for Rigging International that deal with erection issues. As-built drawings are being incorporated into the SY1 and SY2 Pro/E models that will be forwarded to Parsons for use in correctly locating the utilities and equipment for the CSPs.

**PROBLEMS/IMPACTS/  
CORRECTIVE ACTIONS**

Extremely limited engineering coordinator resources are impeding efforts to identify potential vendors. Compromises to the already tight SY gate valve and roving mirror kinematic assembly schedules are resulting due to lack of coordinator support. A shortage of engineering coordinator resources has impeded progress on developing qualified bidders and slowed progress on requisitions. The Project has identified coordinator support that will be reassigned from other areas in May.

The evolution of loose rust on the interior beamline surfaces over the life of the NIF, due to free-iron contamination, continues to be a concern since it could migrate and damage optics. Consultation with LLNL and off-site corrosion experts indicated that surface contamination of stainless steel during fabrication is a frequent occurrence. It was recommended that stainless-steel parts have a surface acid etch, similar to that described in ASTM A380, performed prior to precision cleaning. An ECR for the cost associated with this is expected to be presented to the CCB in May.

**PROCUREMENTS**

No major procurements (over \$100K) were awarded in April.

**VARIANCES**

The rebaseline process has not been completed, and therefore, there are currently no variance statements for FY00 cost or schedule.

**UPCOMING MAJOR  
ACTIVITIES**

- Plan the Jacobs submittal of IMI Services proposal in May, with negotiations and preparations to award contract continuing into July.
- Continue work for completion of Title II GFE and CSP designs and place orders for remaining beampath systems GFE, under this WBS, as designs are completed.
- Continue GFE preparation activities to complete the spatial filter end and center vessel assembly and cleaning.



- Install spatial filter tower support table kinematic actuators to support construction.
- Award contracts for the following items:
  - Ghost mitigation hardware for beam tubes with an estimated value of \$250K.
  - Laser bay interstage enclosures with an estimated value of \$1200K.
  - Periscope and LM1 support structure stainless-steel cladding with an estimated value of \$1900K.
- Release for Bid the following items in May:
  - TSF extension/injection tubes with an estimated value of \$300K.
  - Laser bay and switchyard p-gaskets with an estimated value of \$500K.



## WBS 1.5 INTEGRATED COMPUTER CONTROL

**ACTIVITIES** Front End Integrated System Test (FEIST 2): On April 28, 2000, the control system team met the TPIP milestone titled “Front-end laser control system software released.” The fourth release of NIF software consists of controls for the master oscillator, preamplifier module and input sensor package. The deployment includes integrated supervisor and front-end processor (FEP) controls, laser shot cycle coordination and shot setup capability, and triggering by the integrated timing system. The beam control shot supervisor software was deployed with capability for reading the shot setup plan data, determining device positions, and moving the devices to shot positions. The laser diagnostics supervisor sets up and controls the following sensors: photodiode, calorimeter, attenuator, video camera, power sensor, and input sensor.

The release is composed of 53 programs built from 223 software components and 18 graphical user interfaces. In cases where actual device hardware was not yet available, software emulated devices were used. As part of the milestone, the team completed coding, unit testing, and integrated testing. The software has been released for formal testing beginning next month.

*Additional Front-End Processor (FEP) Software:* The Power Conditioning FEP was successfully deployed with a Java graphical user interface (GUI) that operates test hardware and is also interfaced to a bank module emulator developed by Sandia National Laboratories. The Hartmann wavefront sensor and deformable mirror FEPs successfully demonstrated closed-loop control for a single beam in the wavefront lab and were released to the test team. An interim release of the high-resolution camera FEP using the framework and Java GUIs was also delivered in April. Target diagnostics and PEPC FEPs are also under construction with interim releases scheduled for December 2000.

*Controls Testing:* The test group completed formal testing of the FEIST 1.5 release, April 2000, and produced a draft test summary (NIF-0046245). Plans were then developed and procedure preparation initiated for the FEIST 2 release; FEIST 2 tests will be conducted in May and June 2000. Requirements for an expanded testbed were defined, and a layout for this new facility was created and coordinated; definition of FY00-01 hardware procurements for the new testbed was started. Testing was completed for a new version of the software



defect-tracking tool, and beta testing was initiated for a project-wide problem identification and tracking tool.

*Software Configuration Management:* The deployment of the major release FEIST 2 was completed in April 2000. The configuration management function carried out two obligations supporting this deployment: assuring that the deployment was a complete and consistent product with all the intended components, and managing the flow of change requests that guide the evolution of software releases from FEIST 1.5 to FEIST 2.

The testing on FEIST 1.5 generated 52 change requests. The software CCB authorized 13 changes to be inserted into the FEIST 2 release. The balance will appear in interim patches to FEIST 2, or else to the FEIST 3 release. Initial operation of the FEIST 2 release generated 22 new change requests. Of these, 19 were deemed urgent since they caused at least partial loss of functionality. All 19 urgent requests were expedited, and the release (within two weeks) of a patched FEIST 2 product will support the entire formal test plan.

*Integrated Safety System:* Back-checking of wiring diagrams is approximately 98% complete. Final corrections have been entered with completion of the task expected by May 2000. Testing was begun on the final version of the programmable logic controller command buffer for receiving command and status information from the FEP.

*Target Area Vacuum System:* Work continued to update the target area vacuum system control interconnect drawings (~200 sheets), which is currently ~50% complete and is expected to be complete in late May 2000. An I/O model for the cryogenic pumps and chamber turbo pumps was completed. The first version of the vacuum system device interlocks was completed.

*Utility Controls:* Specifications for GFE under CSP-14A and B were completed. Work is continuing to update the wiring diagrams for the tempered water system, gas handling system, synthetic air system, and spatial filter vacuum system. This involves minor corrections and the addition of cable numbers where appropriate. This effort is expected to complete by the end of May 2000.

Pre-award discussion continued with Jacobs Engineering on a contract to implement the utility control systems for the spatial filter vacuum system, synthetic air cooling system, argon system, tempered water system, target area vacuum system, and the final optic assembly cooling system. Preliminary estimates indicate that the control system portion of the contract will total approximately \$4.2M.



*Integrated Timing System:* Progress continues with hardware procurements and testing. An initial contract meeting with Highland Technology reviewed the proposed delay generator acquisition schedule and discussed possible design upgrades. Failures that were revealed during long-term testing on site were also examined. Out of four boards in the NIF inventory, one had a failure in the firmware memory and another had a delay setting problem in one of the eight available channels. Highland agreed to correct design problems and provide a unit for retesting before delivering the first lot of production delay generators in late summer 2000.

Both the prototype and first-article timing transmitters from Timing Solutions experienced failures during on-site testing. A connector on the prototype unit shorted and subsequently damaged a computer board. This unit was returned to the vendor, who will upgrade the prototype to the first-article design and return it by May 2000. The first article transmitter was determined to exhibit insufficient power output on two of sixteen amplifier channels. Because there is currently no spare, this unit will remain in service with 14 usable channels until it can be exchanged with the upgraded prototype.

**PROBLEMS/IMPACTS/  
CORRECTIVE ACTIONS**

*Video Distribution System:* The manufacturer of the video digitizer computer board that is designed into the video and Hartmann sensor FEPs has announced it will drop the product within one or two years. The vendor plans to redesign a similar product and driver software in approximately two years. In response, the procurement of NIF boards will be delayed until the new product is available. No schedule impact is anticipated, and the overall costs should remain the same. However, there is some risk that the vendor's strategy may change, which could be mitigated by purchasing all boards from current production. Approximately 250 boards are needed that will cost \$220K. This type of problem will likely re-surface elsewhere due to the extended NIF construction schedule, especially in view of the rapid rate of change in the computer industry.

*Testbed:* Hardware resource conflicts between formal tests and developers are increasing. Additional hardware will be purchased to allow formal testing to occur in parallel with developer unit testing. More space is also needed to support the hardware and the number of staff required; several alternate locations are under consideration that will provide sufficient space. A move to new space is expected by late summer 2000.



**PROCUREMENTS**     *Timing delay generators:* After review with users, the total quantity of delay generators required has increased substantially from 170 to 220 boards, which includes 20 spares. The vendor is ordering critical components for the full number units this month, and the contract will be modified to reflect parts for 220 units. Because of the extended Project schedule, additional parts may become difficult to obtain later and should be added to the critical component list. The critical component list is under discussion with the vendor, Highland Technology. Additional required critical parts are expected to cost another \$100K in the current contract. However, this cost is recoverable by reduced cost per board on subsequent delay generator orders.

**VARIANCES**     The rebaseline process has not been completed, and therefore, there are currently no variance statements for FY00 cost or schedule.

**UPCOMING MAJOR ACTIVITIES**

- A written plan describing the next release of control system software will be prepared May 2000. The plan will address new functionality for the laser front end, power conditioning, target diagnostics, and industrial controls.
- 100% design review of the fiducial cross timing system will be held May 2000.
- Formal testing of FEIST 2 software is scheduled for completion in June 2000.
- A software quality assurance surveillance will be conducted against the FEIST software release and formal testing during June 2000 by an independent team from the Software Technology Center. The surveillance report is expected July 2000.



## WBS 1.6 OPTICAL COMPONENTS

### ACTIVITIES

KDP and DKDP Crystals	<p>One rapid-growth run was completed in April, resulting in a switch crystal boule with a yield of 10 crystals. As of the end of April, current projected yields are 120 switch crystals, 68 doublers and 35 triplers. (These yields exclude material for 21 doublers and 14 triplers that is being reserved for the CEA as a part of the collaboration agreement.) A low-temperature, horizontal-growth DKDP run was begun at LLNL. This growth run will be used to confirm the beneficial effect of low-temperature growth on DKDP bulk damage.</p> <p>A full-size polycarbonate tank suitable for initial system testing was delivered to LLNL. The tank will be put into operation for initial testing in late May.</p> <p>All but one conventional growth DKDP seed crystals have been planted, and growth is proceeding uneventfully. Test samples for evaluation of bulk damage threshold were planted in four tanks. These samples will be removed in 6 to 8 weeks and then cut for bulk damage testing.</p>
Optical Design	<p>A preliminary integrated model of one beam-line (B137) was completed in CODE V. This model includes the ILS starting at the serrated aperture, the main laser system, switchyard transport mirrors, and the final optics assembly.</p> <p>The ILS models (B131-148) for MPaIIb were put into configuration management (CM).</p> <p>The Chamber Center Reference System (CCRS) is almost complete. The bill-of-materials was tabulated and submitted for approval. The Optical Configuration Drawing and mechanical drawings still need to be completed. The element-coordinate file is being developed to assist in generating the drawings.</p>
Optical Pulse Generation and Injection System Optics	<p>The small optics production plan was completed in April. This included a revision to the procurement plan to incorporate the current strategy to procure the small optics in integrated packages wherever reasonable from a cost and risk standpoint. Manufacturing requirements were defined with estimated risks and current mitigation plans. The plan for small optics QA and Metrology was also documented as part of this milestone.</p>



The rework of two laser rods was completed in April for use in the first-article PAM packages. The rods were reworked from old Nova rods and then coated at LLNL using special tooling.

**PROBLEMS/IMPACTS/  
CORRECTIVE ACTION**

None.

**PROCUREMENTS**

No major procurements were made this quarter.

**VARIANCES**

The rebaseline process has not been completed, and therefore, there are currently no variance statements for FY00 cost or schedule.

**UPCOMING MAJOR  
ACTIVITIES**

- Work is starting on the 1 $\omega$  power diagnostic. The goal for system efficiency has been increased four times over the current design.
- The system model is ready to be exercised for cross-coupling matrices, system level tolerance trade-offs, and other engineering analysis.



## WBS 1.7 LASER CONTROL

**ACTIVITIES** Work has continued in the design, fabrication, and testing of laser control systems. Release of design drawings under CM continues to be a concern (see Problems/Impacts/Corrective Actions). Design work is heavy in the following areas: precision diagnostics system (PDS), roving mirror diagnostic assembly (RMDA), towers, tower test stand, relay optics, and lower injection system. A major design effort was concluded this month when the GFE installation drawings for the PDS and RMDA were completed. The review of these and other drawings were a key part of the CSP-19, Switchyard Beampath Enclosures, 100% design review held this month.

**Alignment Systems** The Input Sensor Prototype is ready for the move to the PAM lab for FEIST testing. It was recently modified on the main beampath side to add higher resolution detector packages as required for FEIST Testing. The ongoing remote operation tests with the input sensor will be ending soon as it is prepared for the FEIST move. An IWS for the safe lifting and transporting of the input sensor is being prepared in preparation for the move.

Tower kinematic mounts are being installed in CSP-12. This month one cluster of CSF kinematic mounts were installed and surveyed in place. Next month's plan is to install three more clusters. An installation procedure outline was written, which included a kinematic mount functional test. Approximately 80% of the kinematic mounts have been delivered from Armstrong Technologies, and the remainder should be delivered by the end of May.

**Beam Diagnostics** The PDS and RMDA drawings to support the 100% CSP-19 installation bid package design review were 99% complete at the end of April. The April 6 date for submission of drawings was met. The package will be 100% complete by the due date of May 3. Throughout the month all of the design resources were directed toward creating and completing the installation drawings necessary for inclusion of the Precision Diagnostic and Roving Mirror Diagnostic Assembly beam transport equipment into CSP-19.

Tower disassembly and other work began to prepare the B391 switchyard as a PDS GFE hardware and diagnostic table assembly area. Design criteria was developed to allow table pedestal and earthquake bracing design to begin. The assembly area draft IWS was modified; it is undergoing further internal review.



**Wavefront Control  
Systems**

The Laboratory for Laser Energetics (LLE) has begun ramping up its effort for deformable mirror (DM) assembly and associated facilitization. Good progress was also made in the design of masks for the LLE 72-inch coating chamber to achieve coating uniformity. Runs made on test optics showed very uniform results.

Delivery and deployment of the Wavefront software was completed for the FEIST 2 delivery milestone. Wavefront delivery includes the Ada-95-based Hartmann processor code.

Twenty-six blocks of Xinetics actuators have been received to date. A block contains about 40 actuators, depending on the manufacturer's yield. This is about 23% of the total order (for half of the NIF). Thirteen blocks—about 540 actuators—have been tested so far. They appear to be of very high quality; all but ten have passed all incoming inspection tests (~98%).

**PROBLEMS/IMPACTS/  
CORRECTIVE ACTIONS**

Release of design drawings under CM continues to be a problem. A weekly internal review of status, staffing, and priorities is conducted to insure the highest priority drawings are completed on a schedule consistent with the needs of the project. Also, extensive reviews of the CSP-19 installation drawings were conducted with a checking representative present. It is anticipated that the checking of the approximately 130 sheets associated with CSP-19 will proceed rapidly because of these reviews.

A problem was uncovered in the Oregon Micro Systems stepper motor controller (all 1072 units have all ready been delivered). Modifications proposed by the manufacturer will actually cause other equally unpalatable effects. This problem results in extra motor steps being sent when software is downloaded and the processor is reset to initialize the Versa Modular European (VME) crate. A compensating change will be made to the final version of the motor driver board to lock-out all motor motion during VME crate reset/reboot actions. This fix was prototyped during April and successfully tested, so it will be incorporated in the next motor driver board release.

**PROCUREMENTS**

Approximately 80% of the kinematic mounts for the tower structures have been received from Armstrong Technologies. ECR (1733) is complete.



The order for two units of the upper injection system has been placed with Zygo. Updated drawings have been delivered for their review. Clarification questions from Zygo have been answered.

TSF alignment and CSF platforms—requisitions have been written, and vendors are being identified for the prototype platforms. Delivery is expected in the June/July time frame.

Production is in midstream (52 out of 106 units delivered). The DAWN VME crate order is ahead of schedule as first deliveries started in March 2000. Delivery of the final unit is not scheduled until November of 2000.

Vavilov fiber contract: Modification #5 to contract B503973 was signed and sent to Vavilov. This modification increases the amount of fiber (needed for implementation of the 3 $\omega$  power diagnostic in the target bay), increases the duration of the contract and changes the delivery schedule.

#### **VARIANCES**

The rebaseline process has not been completed, and therefore, there are currently no variance statements for FY00 cost or schedule.

#### **UPCOMING MAJOR ACTIVITIES**

- Continue cost estimating, detail budget planning, development of CAPs, and overall project rebaseline planning.
- Hold a Requirements and Design Progress Review of the roving mirror diagnostics assembly during the month of May.
- Begin tower weldment procurement in May.
- Complete installation of equipment and cables for the tower test stand in May.
- Hold a design review for the complete lower injection system in May.
- Begin fabrication of large motor control chassis and associated testing chassis.



## WBS 1.8 TARGET EXPERIMENTAL SYSTEM

**ACTIVITIES** *Target Chamber:* Two coats of epoxy paint were applied to the target chamber gunite.

The jacking ring has been put in place and aligned for initial gross alignment of the chamber in May. There is a concern that the location of the target bay center will not be known with sufficient precision at the time of chamber alignment. This may necessitate a final adjustment to the chamber next year. The jacking ring will be left in place until then.

Target Area Structures *Target Area Government Furnished Equipment (GFE) Components:* The four mirror frame design packages that have been prepared for the initial procurement package have been delayed because accurate data for the detailed location of the kinematic mounts relative to the target chamber coordinate system has not been supplied. Until accurate information is available, this procurement will be delayed. The mirror frame specification, statement of work, and procurement review have been completed.

The retractable and removable beam tube drawings are in the checking process, and the specifications are being reviewed. Prototype bellows for the retractable beam tube and the laser mirror (LM) enclosures have been ordered, and a test fixture is being fabricated.

Jacobs' constructability engineers have started to review our recommended construction sequence and are beginning to address the concerns that LLNL has expressed about the potential for construction activities to breach the clean beampath.

*Target Area Beampath and Utilities:* The target area organization continues to provide Parsons with design information for the horizontal and vertical beam tubes that have been modified to fix the beam rotation. It was previously planned that this information would be given to Parsons as part of the July 2000 deliverables package, but, by providing the preliminary data, Parsons should be able to complete the beampath assembly drawings for the CSP-15A design package early.

*Target Chamber Service System (TCSS):* Four bids were received in March on the RFQ package for a "Design and Build" of the utility lift portion of the TCSS. Vendor visits were conducted in April to clarify cost and technical issues in the submittals. A technical review and "Best Value" selection are expected to be completed and the contract should be awarded in May.



The boom lift vendor (PaR Systems, Inc.) visited LLNL in April. PaR and the NIF Project representative participated in design review meetings covering the 100% design of the boom lift. As a result of this review, several action items were issued to PaR for resolution before beginning fabrication of the boom lift.

A design review committee reviewed system requirements of the target chamber servicing system. The review included the requirements for the utility lift, the boom lift, the plenum plug removal system, the level 29 access door, the first wall tooling, and the methods of moving the first-wall panels to the exterior of the target chamber. An Interface Control Document will be written to control the hand off of the panels through the level 29 access door. The review will continue into May.

#### Final Optics Assemblies

During the past month, progress has been made on the FOA with respect to engineering, 3 $\omega$  optics damage, and optics production.

In FOA engineering, the first vacuum isolation valve was received at LLNL. The production contract for the remaining 47 valves was issued to the vendor. Progress continues on the debris shield design. Approximately 50% of the design package has been completed, and initial fabrication estimates are being developed. The remaining 50% of the package is expected to be completed in June. Initial cleanliness testing of a mock debris shield housing was performed. The tests indicate good flow of clean air through the housing. Additional refinements need to be made to the test setup before conclusive cleanliness data can be collected. The required parts have been identified and will be procured in May. The tests should continue in June. The development of the conceptual design for the FOA upgrade continues. During April, progress was made on the exchange mechanism for the disposable debris shield and the external configuration of the integrated optics modules.

Optical imaging of laser damage sites at fluences below the previously reported growth threshold of 5 J/cm<sup>2</sup> showed formation of plasma at localized areas. The emission spectra suggest plasma temperatures of a few eV were present. Photoluminescence imaging of the areas after low fluence illumination show increases in modified material as indicated by a three-peak emission spectrum. This data indicates that the silica is being modified by plasmas at fluences lower than that at which physical damage growth is observed.

X-ray tomography of laser damage sites shows evidence of a 10-micron-thick layer of silica that has been densified by ~20%. Studies in the literature report that densification of silica can lead to increased



susceptibility to generation of  $3\omega$  radiation-induced defects as well as a shift of the absorption band edge to lower energies. It is therefore possible that silica densified by the plasma-induced shock wave may contribute to the absorption of subsequent pulses.

Fine stress cracks have been identified in the surface of diamond-turned DKDP. Some are formed spontaneously, and their occurrence is enhanced by mechanical indentation. They appear to be most prevalent in high-damage resistance, low-temperature, rapid-growth DKDP for reasons not currently understood. Damage samples in a witness crystal in a conventional growth DKDP production tank did not meet NIF  $3\omega$  performance needs, and additional work has started to identify the source of the problem early enough in the growth runs prior to the point where material actually used in the plates is being grown.

Scatterometer upgrades were completed in April, allowing improved repeatability and sensitivity for measuring low-level, wide-angle scatter such as that produced by rough KDP surfaces, etch pits, and many KDP sol-gel coatings. Efforts have begun to identify and modify the silica manufacturing process step(s) that are the source of significant scatter on sol-gel coated KDP optics.

Materials have been received to be evaluated for use as disposable debris shield materials. They include commercial borosilicate glass sheets ranging from 0.4- to 1.1-mm thickness and polymer sheets ranging from 50- to 150-microns thickness from multiple vendors. Optical measurements are under way.

#### Balance of WBS 1.8

The design of the first wall has been completed. The first-wall drawings are complete except for the overall assembly drawing and the installation fixture. A request was made to validate the position of the first-wall mounts in the target chamber. Results will be available next month. A prototype of the first-wall attachment mechanism and flashing was made. Minor modifications were made to the design based on the prototype, and the prototype will be changed to reflect these modifications.

Several reviews of the TCSS were held to ensure compatibility with the first-wall panels and their handling. Changes were made to the ECR submitted to modify the SSDRs at the direction of the CCB4, and the ECR was resubmitted and approved. The boom for the first target positioner was delivered. The procurement for the remaining components continues. The assembly frame was received. The IWS was completed to allow the assembly of the target positioner to begin. The detail drawings of the diagnostic instrument manipulator (DIM) were



completed and placed under CM. Work was done on preparing to issue an RFQ for the first-article DIM components.

Detail drawings of the DIM electrical design are being made. Electrical components parts lists were generated for the first-article DIM in preparation for purchasing. Work is also progressing on the *DIM User's Manual*.

The draft of the AIS and CDIN plan, which are required for classified operations, are being readied for review by DOE.

The *Requirements and Recommendations for Target Diagnostic Development* document has been finalized and approved and is now available in Sherpa, NIF-0018678. The draft *Software Requirements Specification for Shot Data Archival* has been written and is being reviewed. The software for the diagnostic front-end controller has been started with the goal of having a first version by August. The software for the diagnostic controller has also been started.

#### **PROBLEMS/IMPACTS/ CORRECTIVE ACTIONS**

Violations of the NIF Grounding and Shielding Plan have been found and resolved during the construction of the facility and brought to the attention of the Project management. A working group has been formed to determine a course of action to help prevent these violations from occurring in the future and to improve the grounding and shielding in the facility.

It was determined that the air-handling units in the diagnostic mezzanines did not meet vibrational and noise requirements. The mounting was redesigned, which solved the vibration problem. Several air-handling units are being replaced, which will solve the noise problem. An ECR was written and approved to implement the change.

During part of the last quarter the Target Area Structure and Enclosures group lacked the level of designer manpower needed to complete the redesign by August. Additional designers were identified and started in early April. To meet the July 26 deliverable date for CSP-15A, six designers need to be kept until the end of July and additional designers may still be needed.

#### **PROCUREMENTS**

No fabrication procurements were awarded in this WBS during the month.



**VARIANCES** The rebaseline process has not been completed, and therefore, there are currently no variance statements for FY00 cost. However, preliminary IPS review indicated the target area beampath GFE components were potentially on critical path, and efforts are being made to accelerate part design and deliveries. As previously reported, the FY99 milestone, Award Turning Mirror Structures, TA8410105, originally planned for May 1999, with an estimate for December 1999, will be further delayed due to the beam rotation problem. Most recent projections are for phased award starting in June 2000.

- UPCOMING MAJOR ACTIVITIES**
- Map and align the target chamber.
  - Continue redesign of Target Building GFE beam tubes and mirror frames as required for the beam rotation solution.
  - Release for bid 4 of the 24 mirror frame packages in May.
  - Hold a procurement review on target building horizontal beam tubes.
  - Work with Procurement for initial procurements and continue to develop means to reduce schedule impacts of beam rotation redesign on fabrication and delivery of other target area beampath hardware.
  - Award TCSS utility lift design/fabrication contract.
  - Review vendor's (PaR) response to design review action items and authorize start of fabrication.
  - Continue work with Parsons on target bay beampath and handling design issues for CSP-15A and 15B design packages.
  - Issue the RFQs for the components for the first article DIM.
  - Develop the software for the diagnostic FEP and controller.
  - Start the assembly of the first target positioner in the basement of B391 along with the fabrication of the second boom assembly.



## WBS 1.9 OPERATIONS SPECIAL EQUIPMENT

### ACTIVITIES

#### Optical Transport and Material Handling

*Overall Assessment:* The primary focus continues to be on design/drawing completion of the delivery systems and the testing of the first-article systems. The bottom-loading universal delivery system has completed a demonstration of a full PEPC LRU sequence consisting of docking, cover removal, and insertion. Bench top testing of the spatial filter insertion system has been completed. The first fabrications and hardware for the flashlamp and amplifier slab delivery systems are being assembled and tested. Assembly and testing has been completed on the flashlamp and amplifier slabs cover seals and cover removal mechanisms. The fabrication for the second and third transporters is continuing.

#### Bottom-Loading (BL) Delivery Systems

*Universal:* Four demonstrations of the PEPC insertion system were successfully performed for the transport and handling group, the PEPC group, NIF and engineering management, and NIF administrators. Each sequence was performed in the automated mode as it would be done in the NIF laser bays for installation and removal of the PEPC LRUs.

The spatial filter insertion system (SFIS) mechanical and electrical hardware assembly has been completed. The SFIS was tested on the test stand outside of the canister. Measurements were made with a spatial filter LRU to validate the movement profiles for an insertion. The SFIS was installed and removed from the test stand repeatedly to validate the interface of the insertion system latches and electrical connectors during installation. Modifications were completed to the docking structure to mock up the beamline features that interface with the spatial filter LRU.

The integrated testing is ready to begin spatial filter insertions in May. The canister, docking structure, kinematic mounts, mock LRU, and spatial filter insertion system are all ready.

*Universal Beamline Covers:* Fabrication is continuing on the covers. The perimeter seals are being delivered in lots of 50 with the first two received. They will then be vacuum baked and precision cleaned on site at LLNL prior to delivery to the fabricator for installation on the covers. The fabrication and installation of the targets for the transporter are being added to the contract with the hardware for the first 50



covers supplied by LLNL. Final approval of the cleaning process is pending. A visit by the cleanliness group identified several issues to be corrected prior to approval. A trip report is due from the cleanliness group.

*Flashlamp:* The flashlamp canister frame weldment was received and installed on its stand in the test facility. The horizontal translation mechanisms were received from THK. The carriage systems are assembled and ready for wiring. The LRU enclosures have been received and inspected and are ready for installation on the vertical mechanisms. The top plate has been received and will be used to test a docking sequence. The cover remover system fabricated parts have been received, and the purchased parts are due in May.

*Flashlamp FAU Covers:* Fabrication of machined parts for the first bundle of covers is complete, and the second bundle is under way. The quote for the contract for cleaning and assembly of the first and second bundles was received and is in negotiation. The production order for cover seals is under way. The first bundle of seals has been received and rejected due to excess flashing. First-article approval is pending following bakeout and fit and function testing. Bakeout and cleaning of the seals will be done at LLNL and is under way. Upgrades to a larger oven are under way and expected in May, which will improve both the quality and the throughput of the bakeout process. The RFQ for the cover production order (bundles 3-24) is out and should be awarded in May.

*Amplifier Slab Canister:* Completed assembly and testing of the cover remover mechanism. Completed procurement of all 732 amplifier docking receivers. Completed detailed design of the upper canister assembly. Continued detailed design of the LRU insertion mechanism and the canister structure. Created a specification for the LRU vertical lift mechanism. Continued working on the analysis of the canister structure. Created a plan for integrated testing of the slab cassette canister in the OAB loft.

*Slab Cassette Covers:* Received machined parts for the first bundle of covers. Machined parts for the second bundle of covers are due in early June. Received quote for cleaning/assembly/testing of first- and second-bundle covers. Successfully tested the prototype cover seal and received the necessary production seals for the first bundle. Decision was made to bakeout and precision clean seals at LLNL. Cover production order is out for quote.

*Transparent Covers and Cover Changers:* Work has begun on the design of a means of changing beamline covers in the NIF laser bays.



Covers on the NIF beamline will need to be periodically changed for either routine maintenance or because covers have been damaged or their seals are leaking. It appears that the earliest need for such a cover changer will be to install transparent beamline covers to be used during optical alignment checks of the various LRUs during NIF startup. The first LRUs to need such a change will be those using the universal bottom beamline cover.

A prototype transparent cover has been designed, and the design reviewed and approved by the end users in the NIF survey group. A prototype unit is currently being fabricated. Once received and assembled, the cover will be characterized in the T&H test facility in B432. Cover deflection under full NIF positive pressure loading (+10" water) will be measured and compared to calculated values.

Top-Loading (TL)  
Delivery Systems

Inspection and, if necessary, repair of the vacuum sealing surfaces on the vacuum covers for the CSF and TSF center vessels is continuing. The plain bolts on the covers are being changed out to plated bolts for cleanliness reasons. Forty-eight out of 72 vacuum covers have been received, inspected, and delivered to infrastructure for cleaning and installation. Remaining covers will be delivered next month. Refurbishment of the TL canister is currently on hold until a month or two before the beginning of the OAB testing. Completion of assembly drawings is on hold. Work on the safety note for the TL canister support stand has begun. This delivery system will be the first system to interface and test with the OAB systems and is scheduled for early fall.

Side-Loading (SL)  
Delivery Systems

The mechanical refurbishment of the SL skid is completed except for the final cleaning. This system is being used to update the controls system software. This testing will continue until the end of June. Video taping of this system is scheduled for next month. An entire PAM LRU insertion sequence with the mini-PASS will be taped.

Laser Bay Transporter

The new motors for the rear wheels on transporter #1 have been installed and tested. These new motors have decreased the time required to switch between normal and crabbing modes from one minute to approximately 23 seconds. The fabrication of transporters #2 and #3 is continuing. All long lead items have been ordered. A trip to Pittsburgh to visit Alkab is scheduled for next month. Alkab is AGV Products' subcontractor. This is the company that is machining/welding the frames of the transporter. Alkab is currently fabricating some of the hardware that will be used to mount the electrical components. The two transporters will be fabricated concurrently, with the first one leading the second by about two months. The current schedule shows



transporter #2 delivered to LLNL in mid-December 2000 and transporter #3 delivered to LLNL in early February 2001. New features that will improve the transporter battery usage, increase hardware accessibility for maintenance, and enhance the transporter safety systems will be incorporated into the new transporters. There will be a design review of these new features next month. The new transporters are necessary to start the BL delivery systems testing with the OAB systems. It is not required to test the TL delivery system with the OAB.

#### Switchyard and Target Bay Delivery Systems

The CSP-19 95% review was conducted on the switchyard monorail and the vertical rail specifications and drawings. The CSP-19 Project Manager called for a design status review of the monorail and vertical rail, presently scheduled for the second week in May. The Parsons Intergraph CAD model was reviewed to identify interferences in the monorail stay-out-zones. A report was issued describing the interferences found. A mechanical engineer has been assigned to conduct an engineering analysis of the LM4 and LM5 transport fixtures. Design effort was initiated on the roving mirror transport canister.

#### OAB Facility

Final Acceptance of the CSP-5 OAB was effective on April 28, 2000. Contractor-based training has been completed, and the HVAC maintenance and operation procedures are ready for final approval. Maintenance service agreements have been written and are in the review cycle. CSP-17 construction is in progress; co-occupancy of the OAB with the CSP-17 contractor and LLNL personnel is going well.

#### Special Equipment

Fabrication of first-article New Optic Insertion Device (NOID) parts continued. The slab assembly stand procurement contract was awarded. Ongoing effort to prepare for the Management Pre-Start Review (MPR) included work on the following documents:

- Slab Assembly Fixture Safety Note
- Bottom-Loading Docking Port Safety Note
- NOID Acceptance Test Procedure

Detail design and analysis of the Bottom Loading Docking Ports and the Slab Assembly Fixture continued. All six electronic control enclosures have been machined to accommodate CSP-17. The large gross cleaner installation has been completed, and the system is almost ready for use. Installation of the small mechanical parts gross and precision cleaner continued, and system utility hook-ups were completed. Debug and final installation work began, while installation of the large



mechanical parts precision cleaner continued. System utility hook-up continued and debug and final installation work began.

**OAB T&H Equipment** All components for both the end effector and transporter are now complete. The transporter parts are now anodized, and assembly will start May 4. It is expected to take about three weeks to assemble and complete the wiring. Preliminary inspection at Aluma-lift will take place May 25.

**LRU Verification Equipment** The Staubli robot, a key component of LRU Assembly Verification System (LAVS), was set up in B432 and successfully operated. Initial repeatability tests demonstrated that the robot would return to a given position well within the 35-micron spec.

**PROBLEMS, IMPACTS, AND CORRECTIVE ACTIONS** Because space is running out in the B432 test facility, the space allocation drawings are being updated for the facility. Discussions were held with other groups using the facility to plan for everyone's needs. Unused hardware is being moved out of B432.

The Amplifier group has requested that T&H supply enough covers (14) for a fit/leak test of a power amp bus in mid-May. This will delay delivery of the first bundle of precision-cleaned covers by a month.

**PROCUREMENTS** No major procurements were made this quarter.

**VARIANCES** The rebaseline process has not been completed, and therefore, there are currently no variance statements for FY00 cost or schedule.

**UPCOMING MAJOR ACTIVITIES**

- Make a video of the PEPC LRU and PAM LRU installation operations. The video will be used for training and for tour and media groups.
- Perform a demonstration within the next two months of a spatial filter lens LRU insertion/removal full sequence using the Laser Bay transporter and universal BL canister.
- Use the universal BL canister to demonstrate a full stack up of all hardware required to install a periscope LRU.



- Continue assembly and testing of the flashlamp and amplifier slab delivery systems during the next few months as fabrications and hardware are received.
- Continue activation and operation of mechanical parts cleaners.
- Continue programmatic support of CSP-17, OAB build-out.
- Continue putting together OAB MPR Phase I documentation packages.
- Take delivery of OAB transporter (late May/early June).



## **WBS 1.10 START-UP ACTIVITIES**

**ACTIVITIES** Scope, schedule, and budget for this area are being reviewed, and plans for Start-up Activities in FY00/01 are nearing completion. This budget, which has encountered a variety of delays, is intended to cover the Cost and Commitments already incurred in Commissioning Planning, as well as other WBS 1.10 efforts this fiscal year.



## WBS 1.11 ES&H AND SUPPORTING R&D

### ACTIVITIES

- Assurances** All LLNL comments on the draft NIF Supplemental Environmental Impact Statement have been submitted to DOE OAK. All other comments from DOE HQ, etc. have also been submitted. The Final Supplemental Environmental Impact Statement (FSEIS) is scheduled to be released in final draft in May.
- Technical Support** Both laser glass vendors are making excellent progress in the Pilot II melting campaigns with the first NIF-quality glass now being finished at Zygo.
- Schott Glass Technology (SGT) is on schedule to restart their melter for Phase II of the Pilot II campaign by late May. Platinum fabrication for the Phase II equipment was completed ahead of schedule at Englehard. Equipment rebuilding is under way at SGT; several design improvements have been incorporated. Twenty-two amplifier slabs from SGT Phase I Pilot II production were shipped to Zygo for finishing in April; all meet NIF specifications for laser glass slabs. SGT is shipping post-processed slabs to Zygo at the rate of 8–10 per week, which is 3 to 4 times the previous shipping rates.
- Hoya Corporation USA completed a very successful edge cladding run, producing over 2200 slab equivalents of edge cladding. The yield was greater than 90%, exceeding expectations by about a third. The material has been accepted and shipped to the Schott warehouse in Duryea, PA. The Hoya calciner has been installed on time, and is fully operational. It is producing even drier batch materials than expected, which bodes well for the water content in the laser glass. Pilot II production of laser glass amplifier slabs began in mid-April at Hoya, with the first glass expected in early May.
- Tinsley identified the cause of the PSD2 problem that was discovered in March and developed process modifications to correct PSD2 while maintaining figure, slope, and PSD1. The new process was put into production in late April with a goal of producing the first-bundle target chamber vacuum windows and switch windows by mid-May. The Lapmaster continuous polisher (CP) is now performing well and is integrated into the production campaign. All components for the Lens Optical Test System (LOTS) turret, including modifications for the new wedged focus lens, have been received. To avoid future problems



with PSD2 and micro-roughness, a PMM (phase measuring microscope) has been ordered for installation at Tinsley.

Nine amplifier slabs are currently being processed through CCSTP (computer-controlled small tool polishing) at Kodak. Two of the first three slabs met NIF specifications with only one iteration of CCSTP. The third slab will require a second iteration. Kodak is working to determine if they can correlate process parameters with their ability to bring amplifiers to within NIF specifications in one iteration. Kodak is also working to reduce the overall cost of the CCSTP process by using the 24-inch Zygo interferogram supplied with the amplifier to generate the instructions for CCSTP rather than having to remeasure it at Kodak.

Zygo has completed finishing of 148 NIF optics. To overcome raw material inhomogeneity, 17 polarizers and 17 amplifier slabs finished by Zygo require preferential figuring at Kodak. The first amplifier slab was successfully completed by Zygo to meet all NIF specifications without subsequent preferential figuring. LLNL measurements of PSD2 and micro-roughness on LM3 mirrors validated compliance with NIF specification as predicted by measurements on subscale witnesses at Zygo.

LLE has minimized the contribution of coating nonuniformity to both spectral performance and root-mean-square gradient by eliminating a crystal bar assembly and refining the masking. Spectra-Physics has ordered customized bearings to eliminate the failure problems that are occurring in the planetary. The new bearings are expected to arrive in May. Problems with the seals on the cleanline were corrected. However, the weight load of a NIF polarizer exceeds the capability of the robot assembly. Spectra-Physics is working with the robot manufacturer for a short-term solution to enable them to meet their polarizer demonstration milestone and a long-term solution for cleaning production optics.

Modifications of the KDP semi-finishing machine for LLNL process demonstration are nearly complete. These include final assembly of the bridge and installation of fail-safe braking for the fly-cutter, a process oil filtration system, a temperature-controlled oil shower, and guide-way protection covers. The major remaining problems on the Moore final finishing machine are yaw and position control of the tool in-feed slide, and the asynchronous error motion of the fly-cutter spindle. Moore has completed modifications that should reduce the asynchronous error motion, but testing cannot be done until completion of corrective work on the tool in-feed slide.



Installation and mechanical debugging of the amplifier blastshield assembly equipment was completed. Several preproduction blastshields were fabricated and taken through final pressure testing. So far, all preproduction units have failed at the urethane-to-glass seal along the long dimension of the assembly due to a design flaw. Small assembly changes have been proposed and are currently under experimental evaluation. All other aspects of the blastshield assembly process have gone relatively well, and the OPDL currently has the capacity to produce blastshield assemblies at a rate of 2 to 3 per day. Requalification of the blastshield antireflection coating (sol gel) is ongoing.

The new laser diode units for the 24-inch Wyko interferometers that incorporate an optical isolator are working well, and no failures have occurred. Although more time is needed to evaluate lifetime, there is every indication that this problem is corrected. The new laser units were installed in the interferometers located at Cleveland Crystals, Schott, and Kodak in April. The old-style lasers in the interferometers located at Tinsley and Hoya are still operational and will be replaced within the next month. The contract for a backup laser unit using lower power HeNe lasers was placed in April.

The Bauer photometer located at Spectra-Physics is being used by LLNL to refine procedures and better understand the operating characteristics of this newly developed instrument. The photometer currently has problems with system accuracy that are related to the beam quality of the laser, the beam transport system, software that controls sequencing and analysis, and procedures. LLNL is working with Bauer and with the manufacturer of the laser to correct these limitations.

#### **PROBLEMS/IMPACTS/ CORRECTIVE ACTIONS**

Tinsley is well on track to correct the PSD2 error in NIF windows.

The first amplifier meeting full NIF specifications was produced by a combination of finishing at Zygo and small-tool polishing at Kodak. Zygo later succeeded in producing a slab meeting NIF specifications without requiring small-tool polishing.

Spectra-Physics did not complete the polarizer demonstration milestone due to problems with their planetary bearings and cleanline. Replacement bearings have been ordered, and service of the cleanline has been scheduled. This milestone will be completed in May.

Preproduction blastshield assemblies failed the pressure test requirement due to a design limitation. Minor assembly changes are likely to correct this problem, but may impact completion of the milestone for first-bundle blastshields.



**PROCUREMENTS**

A contract for Hoya Pilot II slab run was awarded at \$4,476K.

A \$455K modification was made to an existing pilot production contract at Tinsley to bridge between pilot and production contracts.

A \$135K modification was made to an existing pilot production contract at Kodak to account for rate changes.

**VARIANCES**

The rebaseline process has not been completed, and therefore, there are currently no variance statements for FY00 cost or schedule.

**UPCOMING MAJOR  
ACTIVITIES**

- SGT is on schedule to restart their melter for Phase II of the Pilot II campaign by late May.
- Hoya will produce their first Pilot II laser glass amplifier slabs in early May.
- Tinsley should complete finishing of the first-bundle target chamber vacuum windows and switch windows in mid-May.
- Spectra-Physics is scheduled to coat a NIF-size polarizer with the NIF process and begin metrology in May.
- The FSEIS final draft is scheduled for release in May.

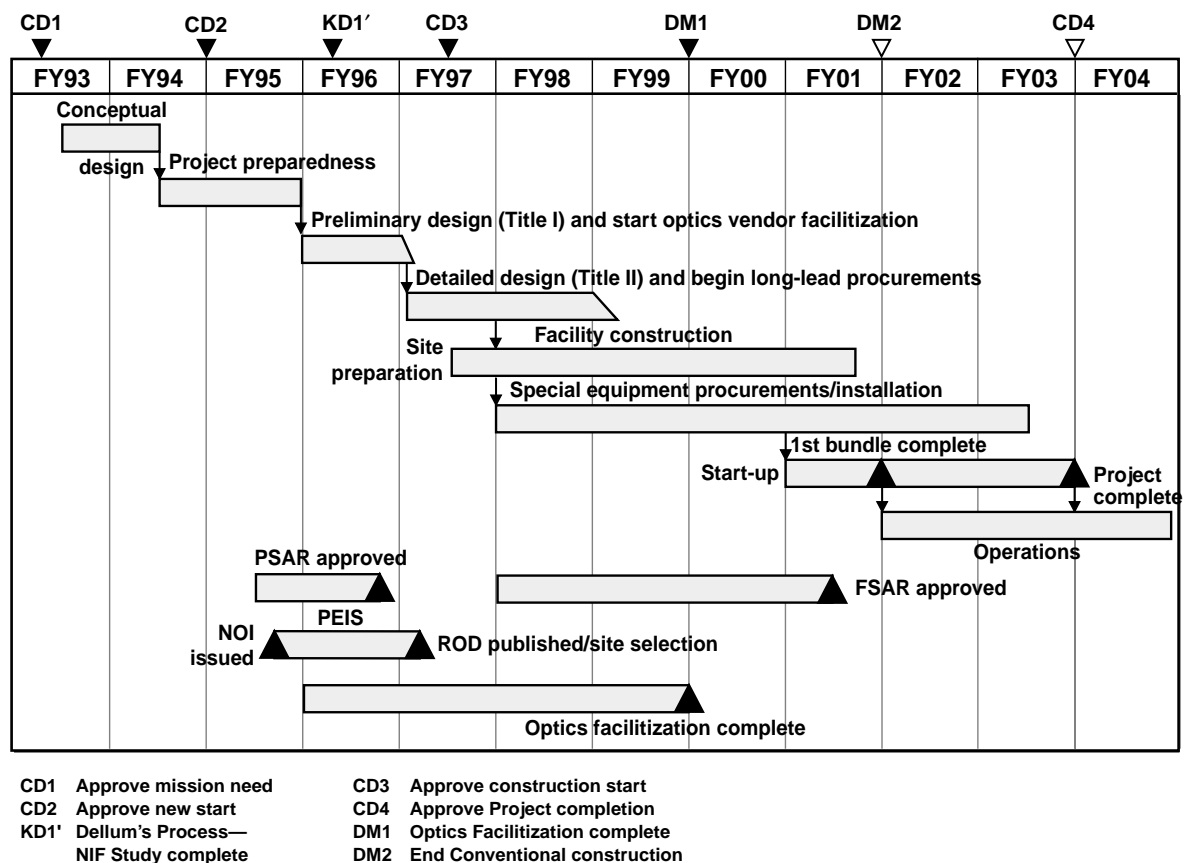


## ATTACHMENT 1: SCHEDULE STATUS

The schedule status section will provide (1) a summary schedule, (2) a status of the NIF Project Execution Plan milestones, (3) a status of the DOE performance measurement milestones, and (4) the critical path analysis.

At this point, Project schedules are being rebaselined to implement the completion options to be selected by the DOE. A bottom-up schedule for Option 1 with 24,000 individual activities was submitted to DOE/NNSA for approval. When the new schedules are prepared, they will be stated in the monthly report.

### Summary Schedule



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08JAP/gbh

11/23/99  
skl

The rebaseline schedule will result in an update to the NIF Project major milestones to reflect the completion options proposed to the DOE. Until the rebaseline schedule is available, the current baseline will be stated.



## Status of NIF Project Execution Plan Milestones

Milestones	NNSA Acquisition Executive Level 0	NNSA Office of Inertial Fusion and the NIF Project Level 1	NIF NNSA Field Office Level 3	NIF Laboratory Project Office Level 3	Date Planned	Date Actual
Approval of Mission need (CD1)	X				Jan 1993	Jan 1993
CDR Complete				X	May 1994	May 1994
Approval of New Start (CD2)	X				Oct 1994	Oct 1994
Notice of Intent Issued		X			Jun 1995	Jun 1995
KD1' Dellums Process Complete	X				Dec 1995	Dec 1995
Architect/Engineer Contracted				X	Dec 1995	Dec 1995
Title I Initiated				X	Jan 1996	Jan 1996
Construction Manager Contracted				X	May 1996	May 1996
PSAR NNSA Concurrence			X		Aug 1996	Aug 1996
PSAR Approved				X	Sep 1996	Sep 1996
NEPA Record of Decision	X				Sep 1996	Dec 1996
Approval to Initiate Title II Design			X		Sep 1996	Nov 1996
Approval to Initiate Long-Lead Procurement			X		Sep 1996	Nov 1996
Approval to Initiate Construction (CD3)	X				Mar 1997	Mar 1997
Issue Pollution Prevention & Waste Minimization Plan			X		Sep 1998	Sep 1998
Optics Facilitization Complete (DM1)		X			Oct 1999	Oct 1999
Start Special Equipment Installation				X	Nov 1998	Nov 1998
Target Chamber Installed				X	Oct 2000	
LTAB Superstructure Complete				X	Dec 2000	
FSAR NNSA Concurrence			X		Feb 2001	
FSAR Approved				X	Mar 2001	
LTAB Construction Complete				X	Jul 2001	
End conventional Construction (DM2)		X			Sep 2001	
ORR/ORE Complete—Start Early Operations			X		Sep 2001	
End of Construction			X		Apr 2003	
Project Complete (CD4)	X				Oct 2003	

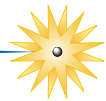


**STATUS OF DOE  
PERFORMANCE  
MEASUREMENT  
MILESTONES**

The NNSA-approved NIF Transition Period Implementation Plan contains a set of performance milestones from October 1, 1999, to June 1, 2000. These milestones are statused by NNSA on a weekly basis. The NIF Monthly Status provides the completed milestones at the end of April 2000.



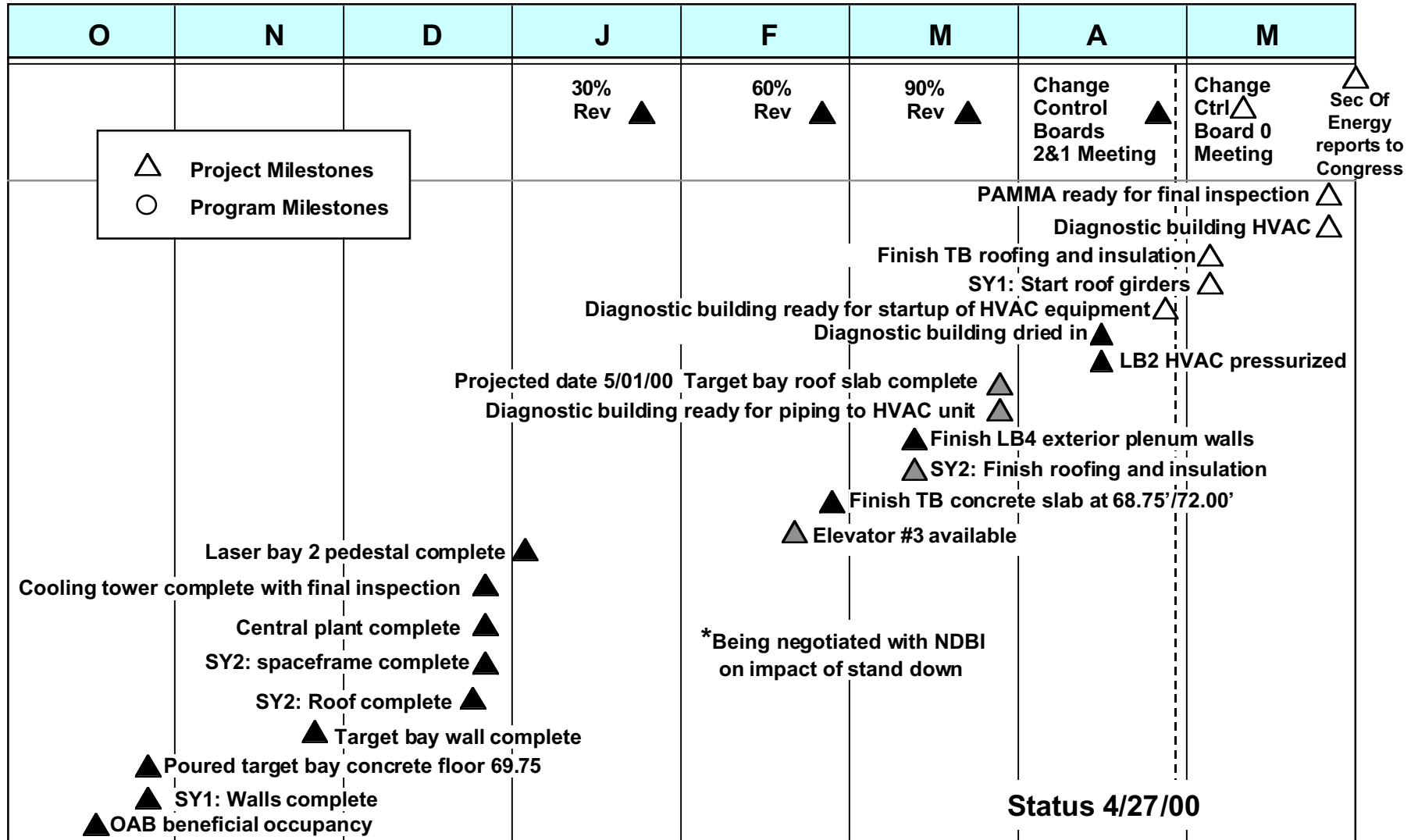
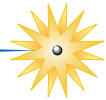
# NIF rebaseline schedule



O	N	D	J	F	M	A	M
			30% Prog. Rep. ▲	60% Prog. Rep. ▲	90% Prog. Rep. ▲	Change Control Board 2&1 meeting	Change Control Board 0 meeting ▲ Sec. of En. reports to Congress ▲
			Projected date 4/17/00 Submit Project Data Sheet to DOE ▲ (DOE action) Complete final Option x cost roll-up ▲ (DOE action) Submit Option x schedule to DOE ▲ Complete final Option 1a cost roll-up ▲ Submit Option 1a schedule to DOE ▲ Preliminary findings of independent cost estimator complete ▲ Initiate Option x planning ▲ Incorporate Implementation Plan into schedule ▲ ▲ Develop BIS Implementation Plan ▲ Contract independent cost evaluator ▲ Develop BIS procurement methodology ▲ Submit Rebaseline Plan				
							Status 4/30/00

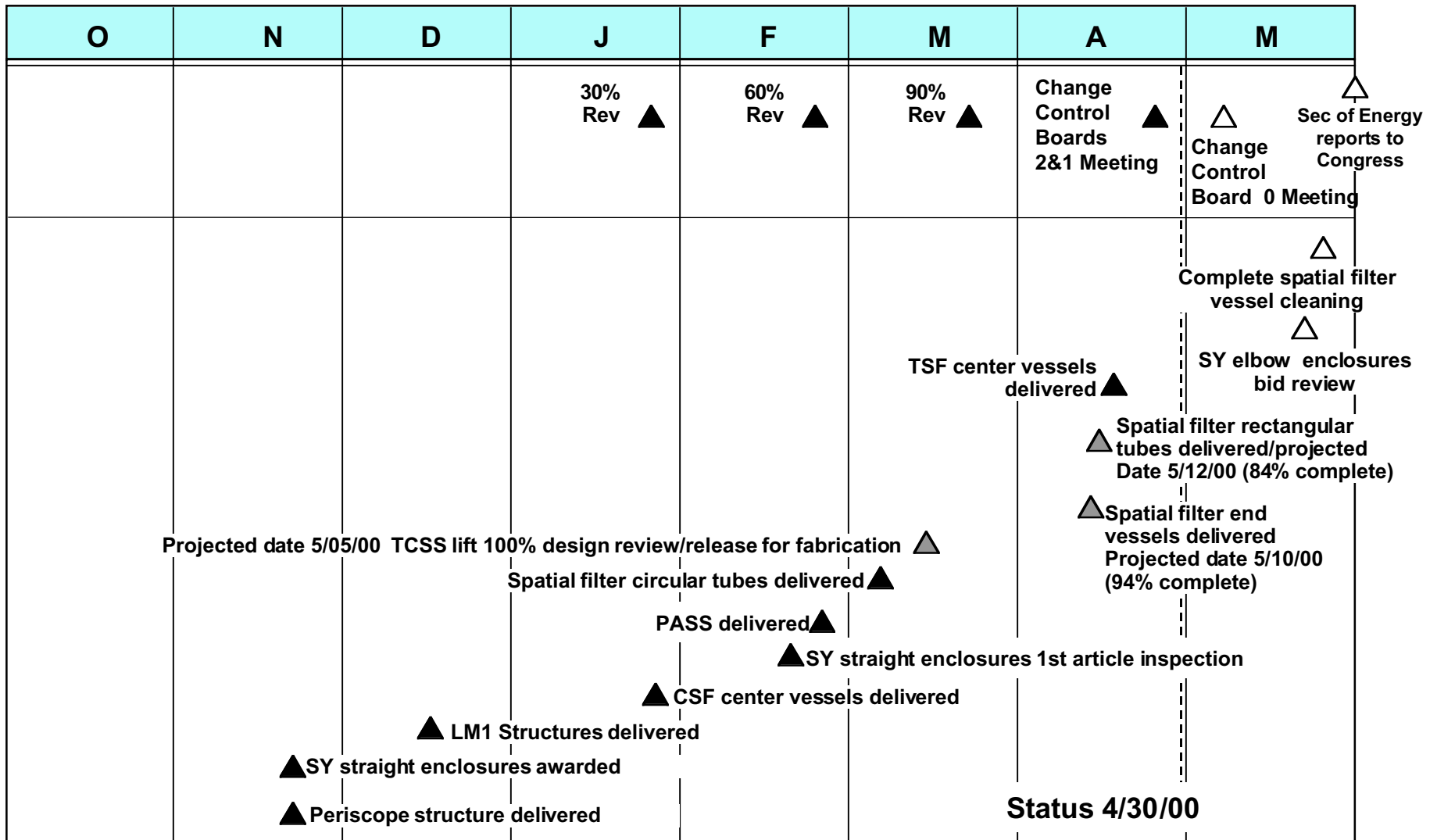


# Conventional Facilities – FY00



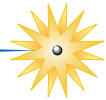


### *The National Ignition Facility*





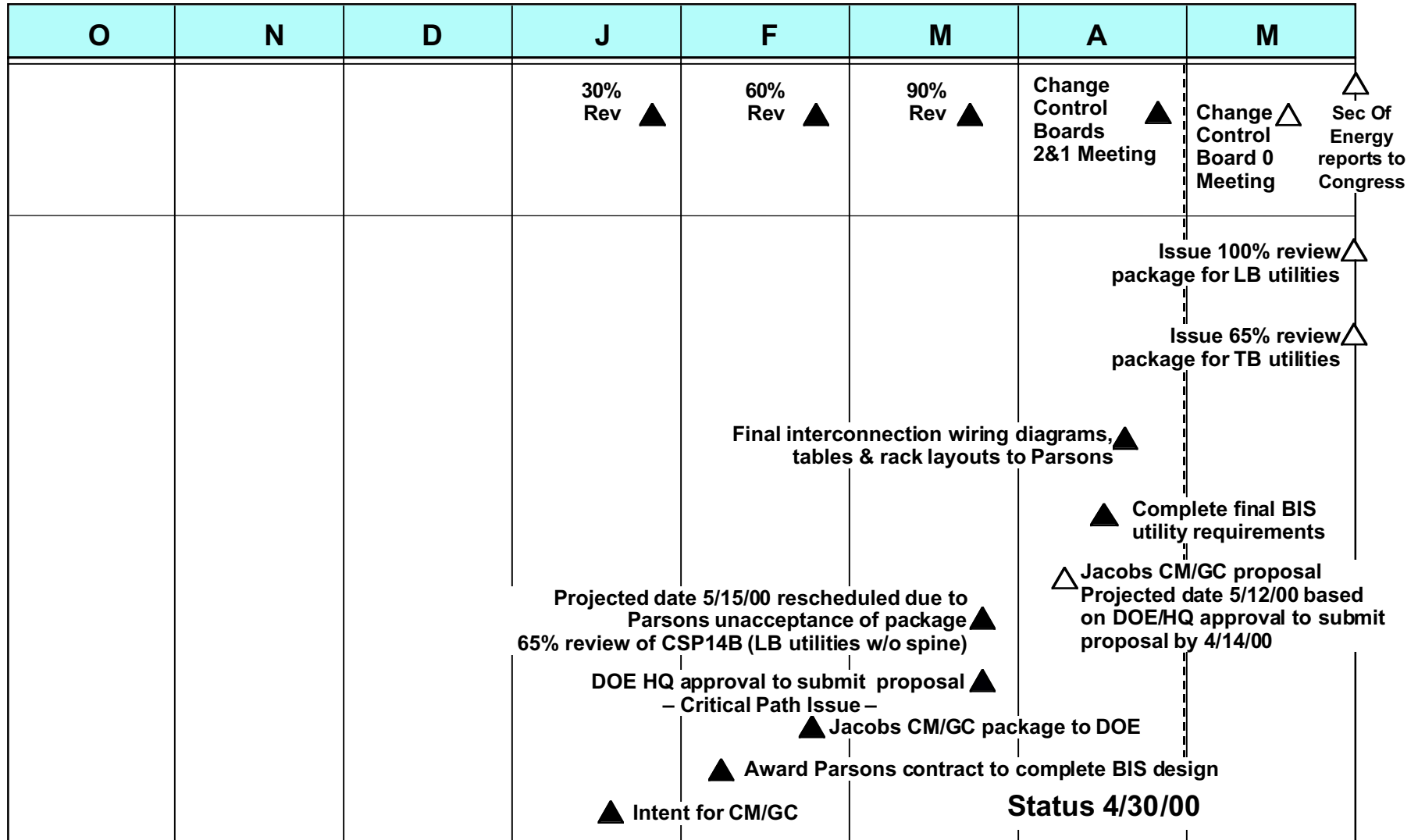
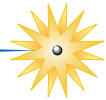
# Beampath Infrastructure — construction subcontract packages – FY00



O	N	D	J	F	M	A	M
			30% Rev ▲	60% Rev ▲	90% Rev ▲	Change Control Boards 2&1 Meeting ▲	Change Control Board 0 Meeting ▲ Sec of Energy reports to Congress ▲
						Projected date 7/01/00 ▲ CSP 16 bid package complete	
						Projected date 5/02/00 ▲ CSP 13 bid notice to proceed	
					▲ CSP 17 notice to proceed		
			▲ CSP 13 bid package complete				
	▲ CSP 17 bid package complete						
						Status 4/30/00	

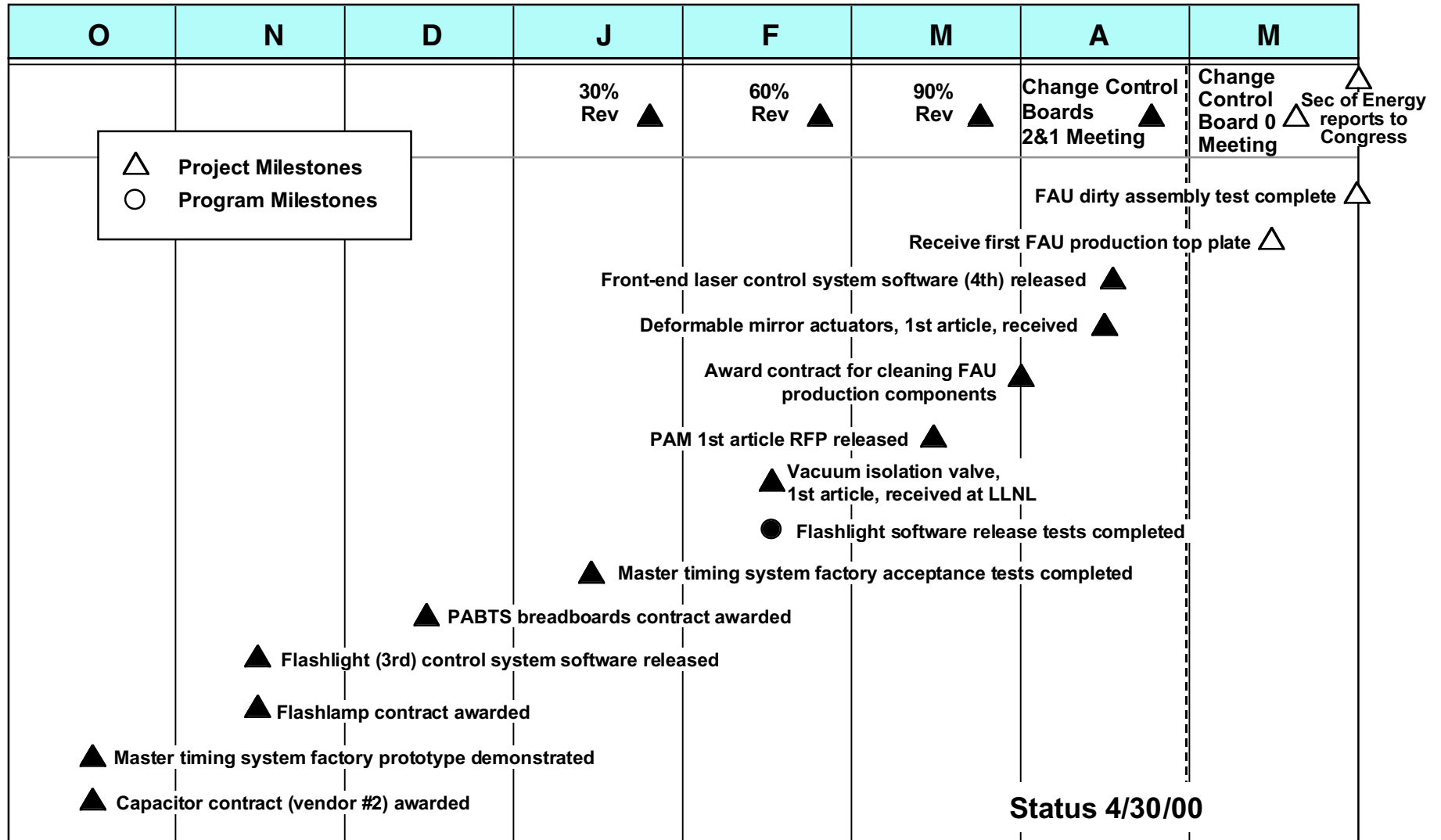
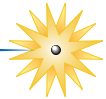


# Beampath Infrastructure — A/E and CM/GC – FY00



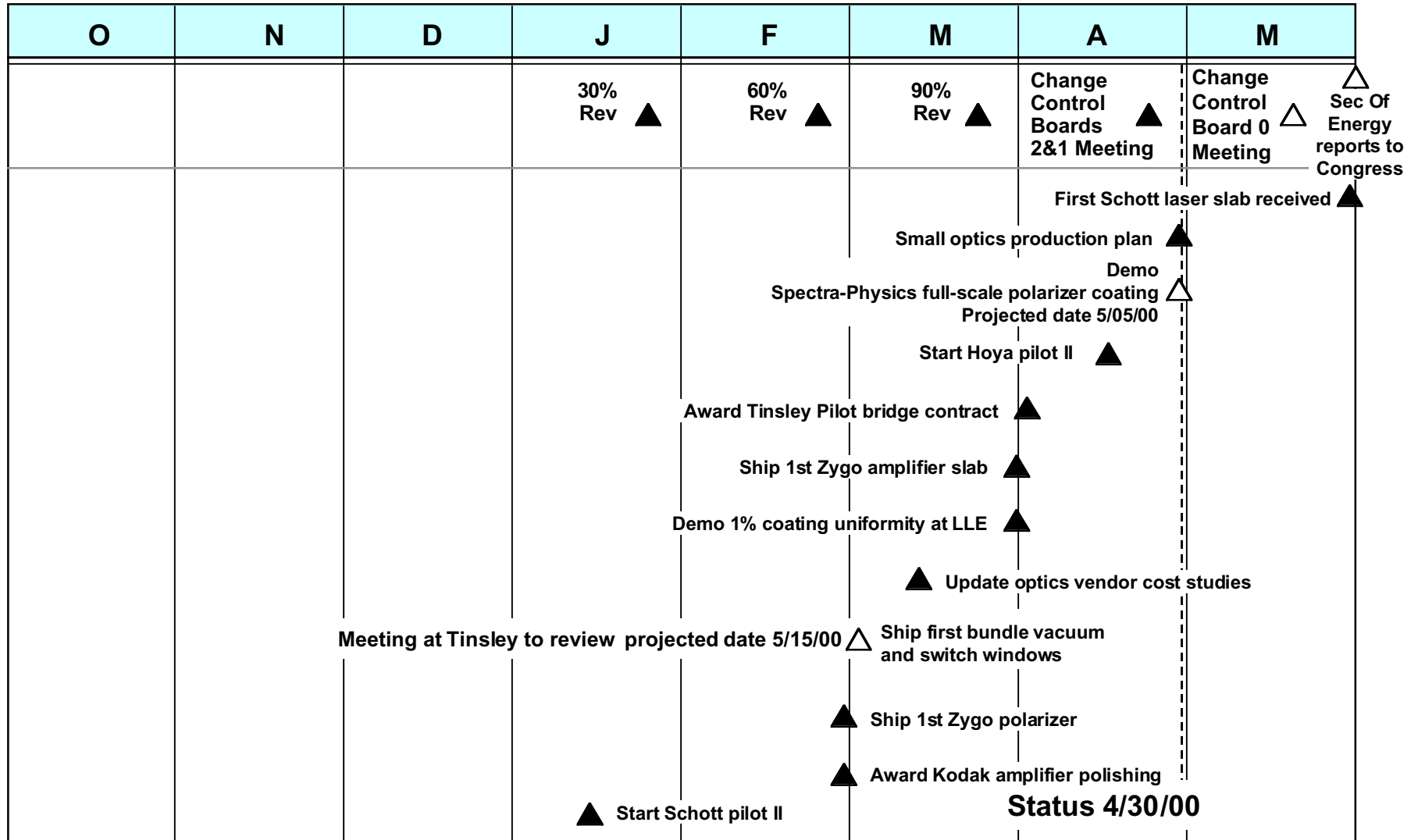
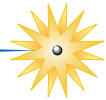


# Line Replaceable Units – FY00



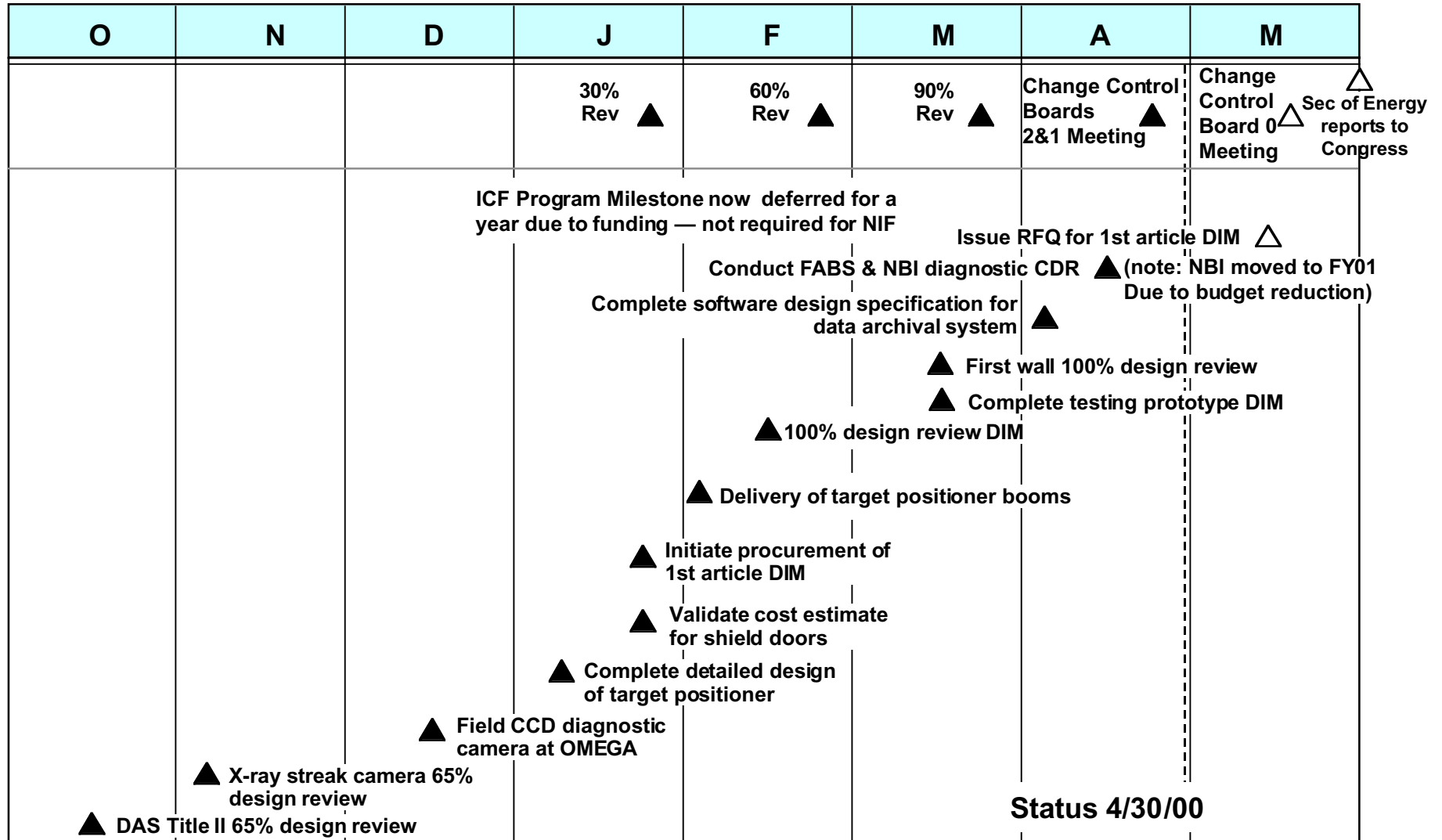
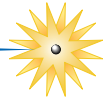


# Optics – FY00



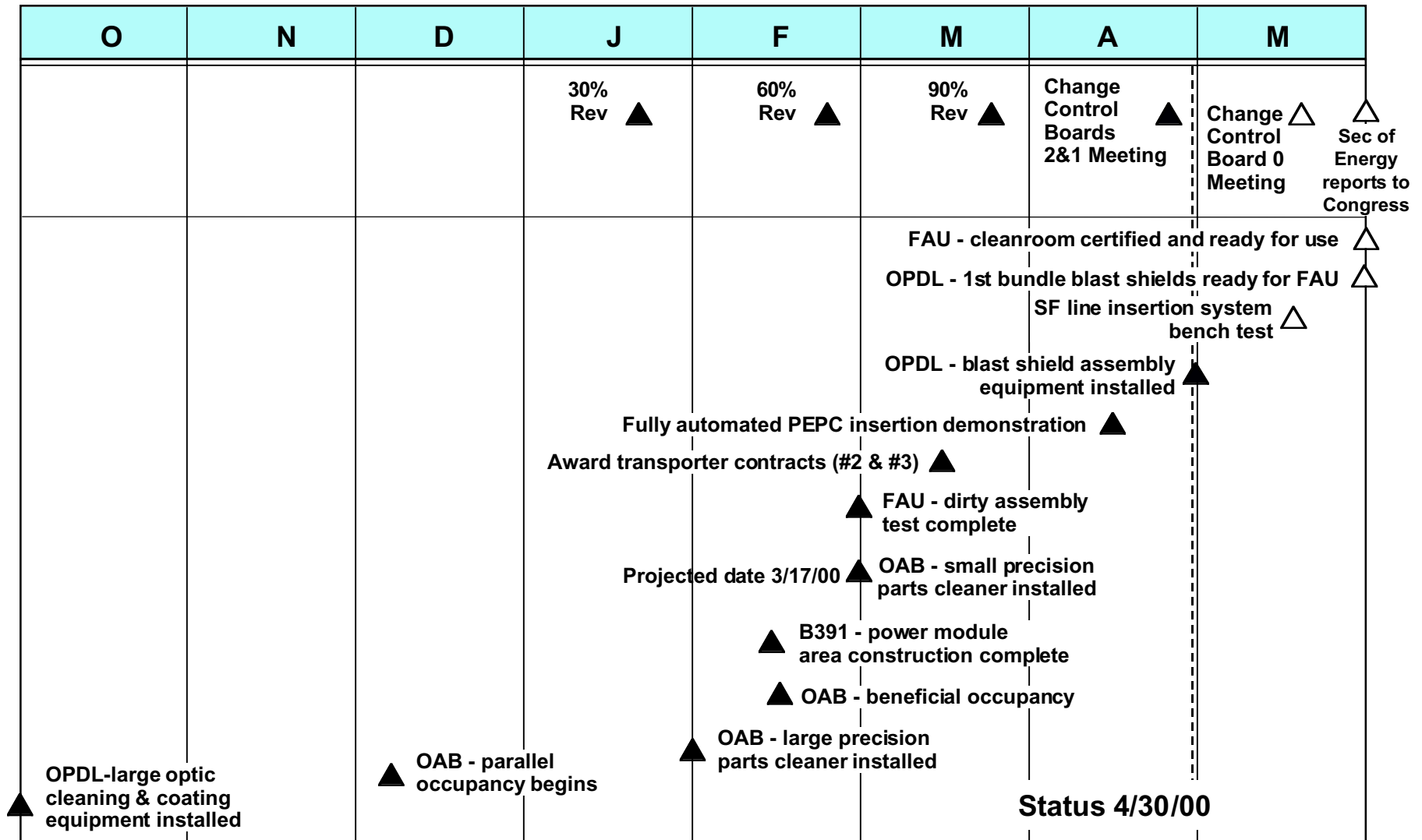
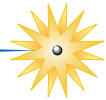


# Target Area Systems and Target Diagnostic Systems—FY00





# Assembly/Refurbishment Facilities – FY00





## **ATTACHMENT 2: FINANCIAL STATUS**

The financial status includes (1) FY00 Plan to Actual Cost and Cost plus Commitments monthly for Total Project Cost, Total Estimated Cost, Other Project Cost, and each WBS Level 2 element; (2) the FY00 Contingency Log; and (3) FY00 monthly Manpower Plan to Actual.

### **PROJECT PLAN-TO- ACTUAL COST AND COST PLUS COMMITMENTS**

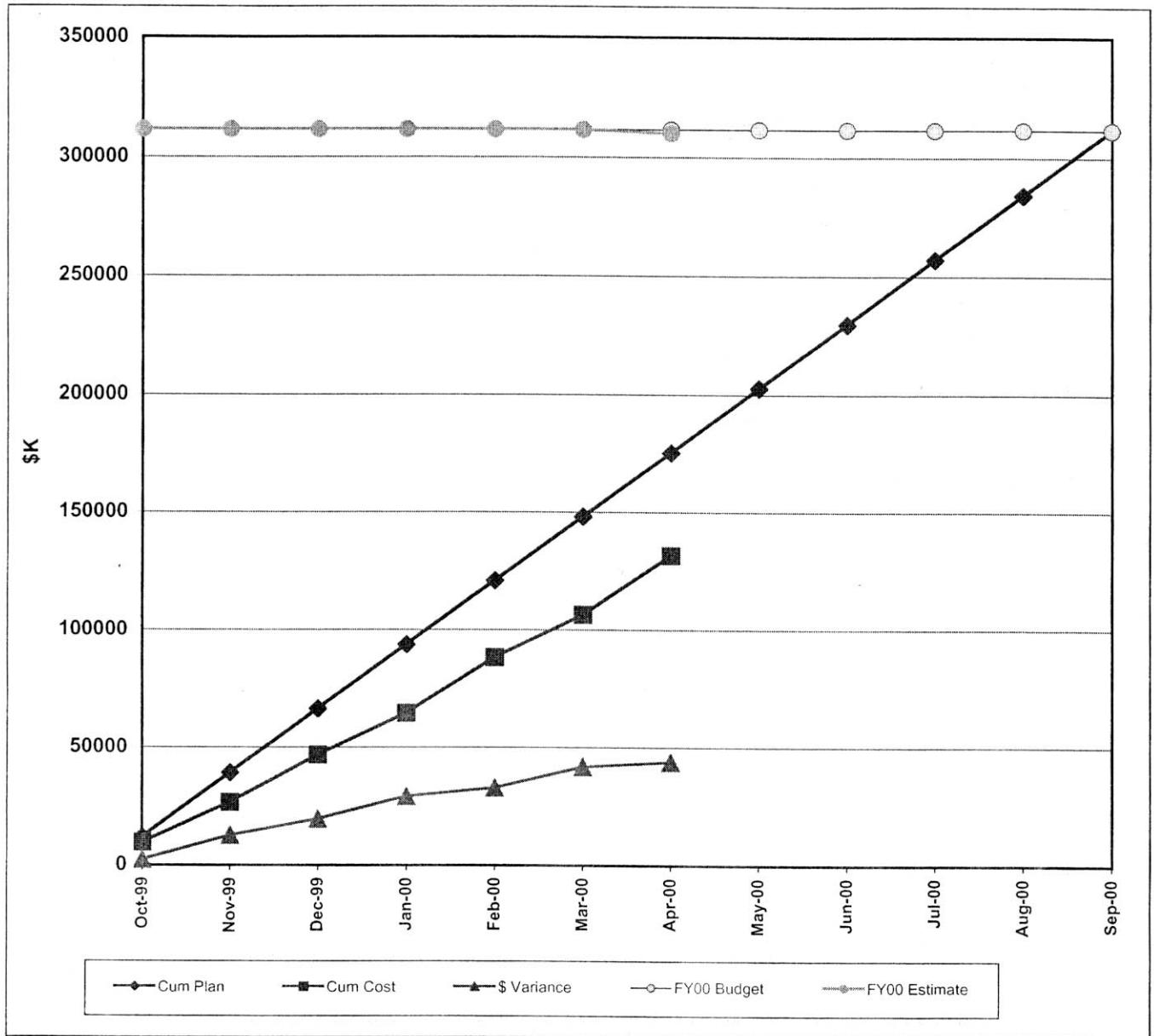
FY00 NIF Cost and Cost and Commitment plans are presently shown as straight-line estimates of the current year budget allocations. FY00/01 CAPs are scheduled to be completed when the rebaselining process concludes.

The April 2000 WBS Level 2 variances resulting from actual versus the drafted straight-line budget plans are not individually discussed. TPC, TEC, and OPC Cost and Cost and Commitment variances ranging from 6% to 43% of actual below straight-lined plans indicate that overall FY00 costs and commitments are well within the current year funds availability. This conservatism is expected to prevail as long as rebaselining efforts are in progress.



**FY2000 Cost Plan to Actual  
as of April 2000  
Total Project Cost (TPC) (\$K)**

Project Number 96-D-111  
April 2000



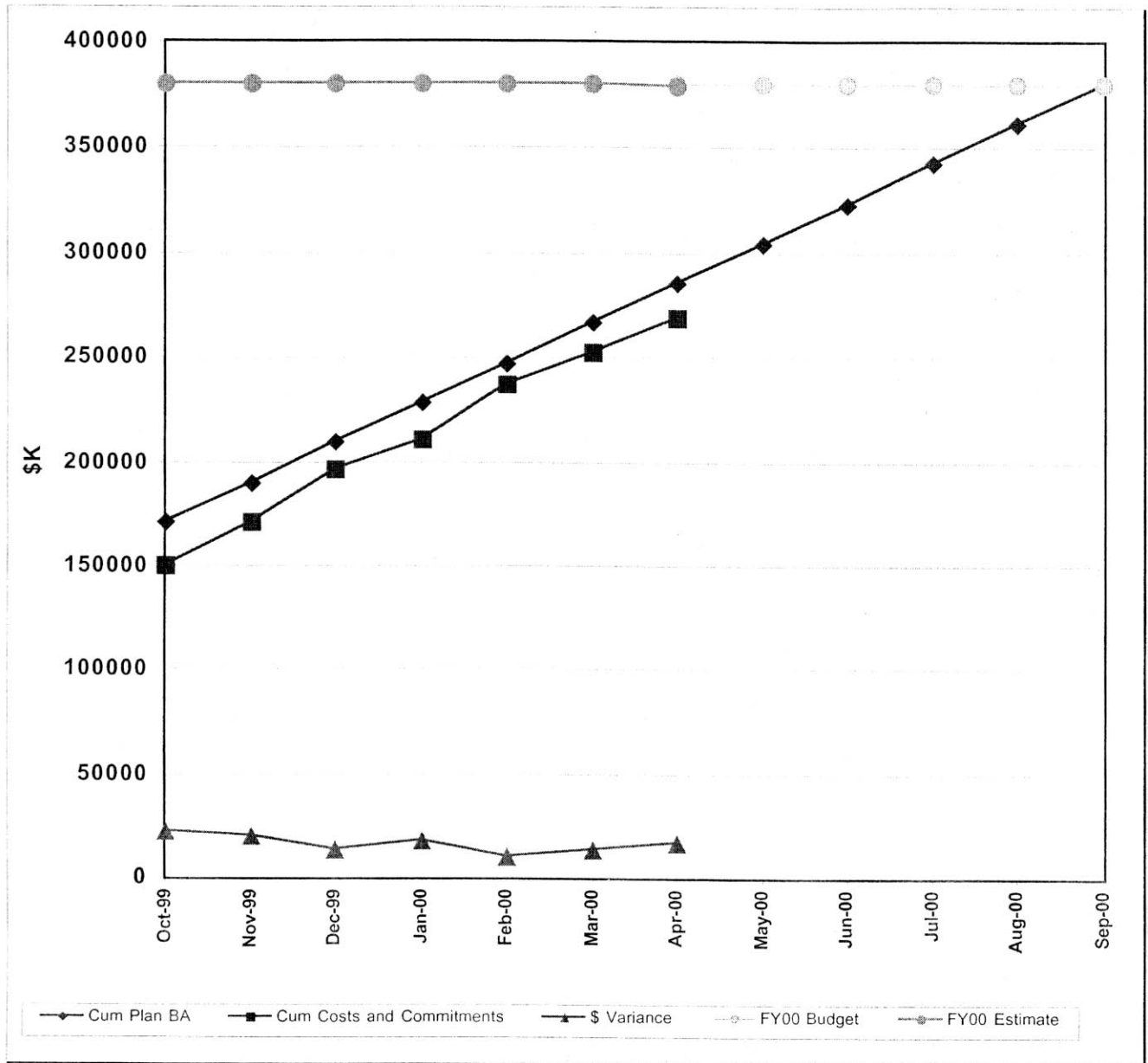
Month	Monthly		Cumulative				FY2000 Budget *	FY2000 Estimate *
	Planned	Actual	Planned	Actual	\$ Var	% Var		
Oct-99	12,057	9,690	12,057	9,690	2,367	20%	311,520	311,520
Nov-99	27,224	17,043	39,281	26,733	12,548	32%	311,520	311,520
Dec-99	27,224	20,136	66,505	46,870	19,635	30%	311,520	311,520
Jan-00	27,224	17,601	93,729	64,471	29,258	31%	311,520	311,520
Feb-00	27,224	23,662	120,953	88,133	32,820	27%	311,520	311,520
Mar-00	27,224	18,329	148,176	106,461	41,715	28%	311,520	311,520
Apr-00	27,224	25,138	175,400	131,599	43,801	25%	311,520	310,004
May-00	27,224		202,624				311,520	
Jun-00	27,224		229,848				311,520	
Jul-00	27,224		257,072				311,520	
Aug-00	27,224		284,296				311,520	
Sep-00	27,224		311,520				311,520	

\* Rebaselining in progress will establish Project TPC BAC/EAC.



**FY2000 Plan to Actual as of April 2000**  
**Total Project Cost (TPC) - Cost and Commitments (\$K)**

Project Number 96-D-111  
 April 2000



Month	Monthly		Cumulative				FY2000 Budget *	FY2000 Estimate *
	Planned	Actual	Planned	Actual	\$ Var	% Var		
Oct-99	171,009 **	149,362	171,009 **	149,362	21,647	13%	380,409	380,409
Nov-99	19,036	21,090	190,045	170,452	19,593	10%	380,409	380,409
Dec-99	19,036	25,391	209,082	195,843	13,239	6%	380,409	380,409
Jan-00	19,036	14,699	228,118	210,542	17,577	8%	380,409	380,409
Feb-00	19,036	26,800	247,155	237,342	9,813	4%	380,409	380,409
Mar-00	19,036	15,326	266,191	252,668	13,523	5%	380,409	380,409
Apr-00	19,036	16,112	285,227	268,780	16,448	6%	380,409	378,869
May-00	19,036		304,264				380,409	
Jun-00	19,036		323,300				380,409	
Jul-00	19,036		342,337				380,409	
Aug-00	19,036		361,373				380,409	
Sep-00	19,036		380,409				380,409	

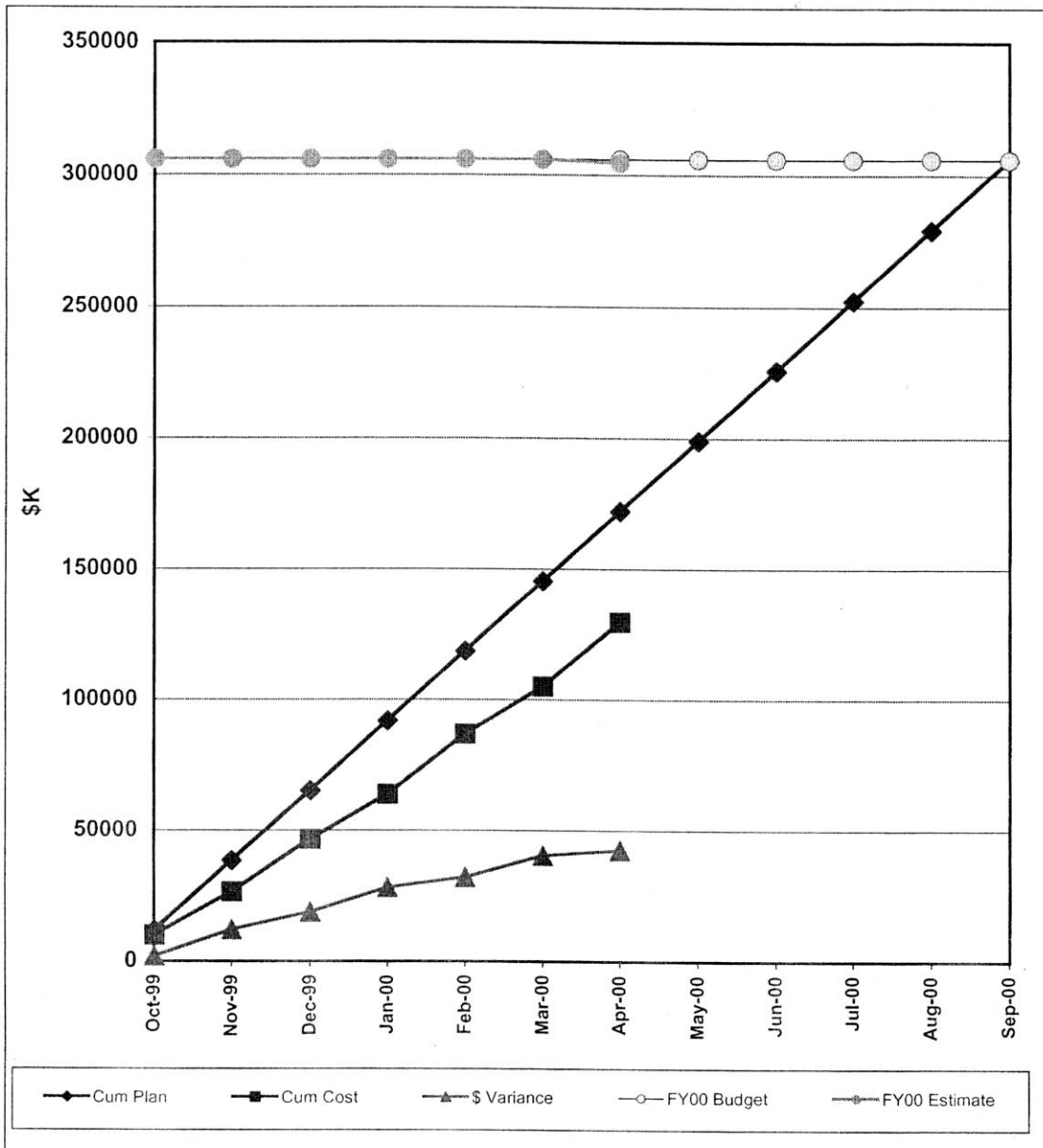
\* Rebaselining in progress will establish Project TPC BAC/EAC.

\*\* Includes \$126,612K of uncosted obligations from FY99.



**FY2000 Cost Plan to Actual  
as of April 2000  
Total Estimated Cost (TEC) (\$K)**

Project Number 96-D-111  
April 2000



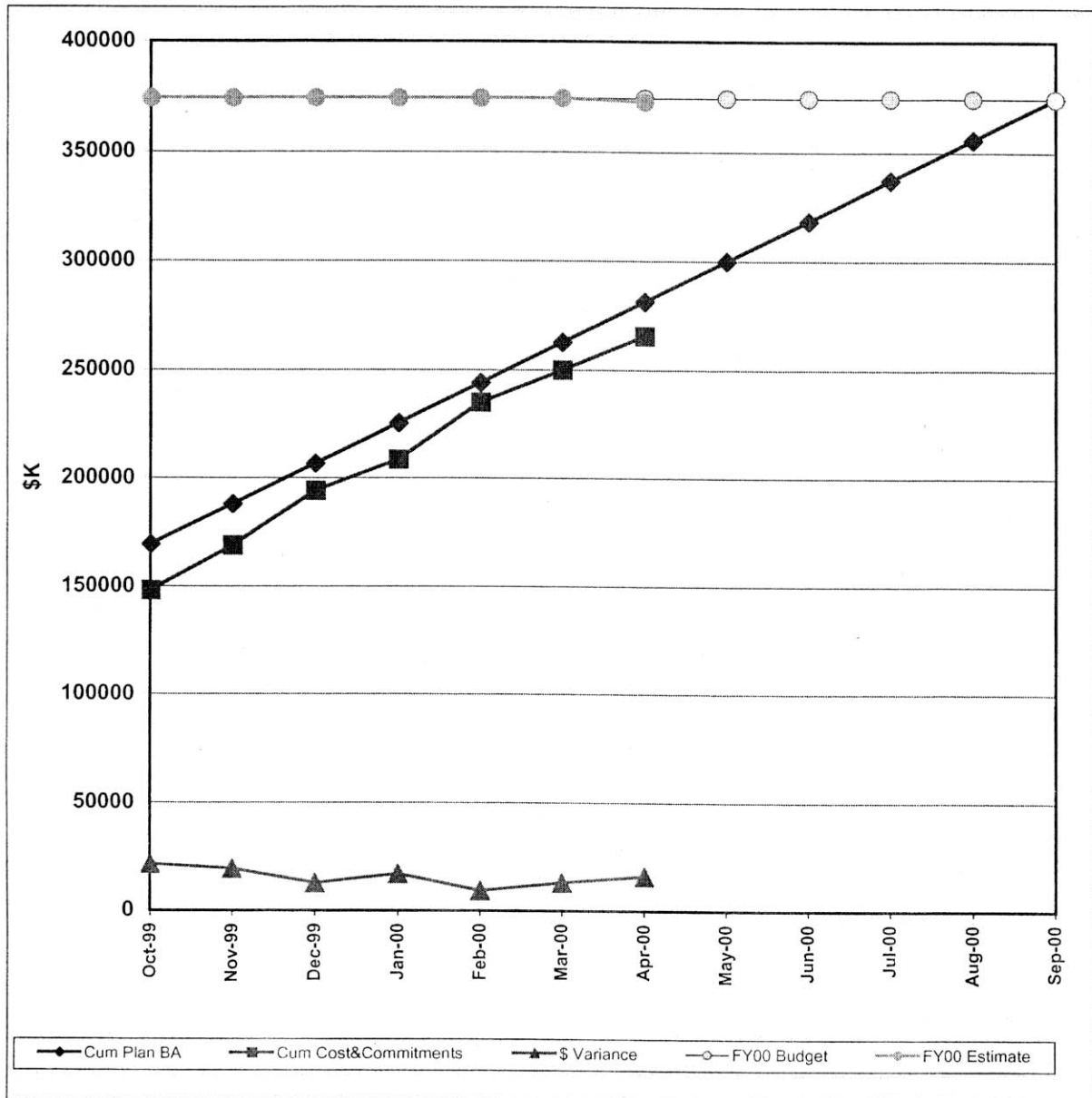
Month	Monthly		Cumulative				FY2000 Budget *	FY2000 Estimate *
	Planned	Actual	Planned	Actual	\$ Var	% Var		
Oct-99	11,647	9,826	11,647	9,826	1,821	16%	306,054	306,054
Nov-99	26,764	16,570	38,411	26,395	12,016	31%	306,054	306,054
Dec-99	26,764	20,132	65,176	46,528	18,648	29%	306,054	306,054
Jan-00	26,764	17,295	91,940	63,823	28,117	31%	306,054	306,054
Feb-00	26,764	22,957	118,704	86,779	31,925	27%	306,054	306,054
Mar-00	26,764	18,325	145,468	105,104	40,364	28%	306,054	306,054
Apr-00	26,764	24,674	172,233	129,778	42,454	25%	306,054	304,538
May-00	26,764		198,997				306,054	
Jun-00	26,764		225,761				306,054	
Jul-00	26,764		252,526				306,054	
Aug-00	26,764		279,290				306,054	
Sep-00	26,764		306,054				306,054	

\* Rebaselining in progress will establish Project TEC BAC/EAC.



**FY2000 Plan to Actual as of April 2000**  
**Total Estimated Cost (TEC) - Cost and Commitments (\$K)**

Project Number 96-D-111  
 April 2000



Month	Monthly		Cumulative						FY2000 Budget*	FY2000 Estimate
	Planned	Actual	Planned	Actual	\$ Var	% Var				
Oct-98	169,417	** 148,023	169,417	** 148,023	21,394	13%		374,416	374,416	
Nov-98	18,636	20,837	188,053	168,860	19,194	10%		374,416	374,416	
Dec-98	18,636	25,315	206,690	194,175	12,515	6%		374,416	374,416	
Jan-99	18,636	14,429	225,326	208,604	16,722	7%		374,416	374,416	
Feb-99	18,636	26,251	243,962	234,855	9,108	4%		374,416	374,416	
Mar-99	18,636	14,981	262,599	249,836	12,763	5%		374,416	374,416	
Apr-99	18,636	15,742	281,235	265,578	15,657	6%		374,416	372,876	
May-99	18,636		299,871					374,416		
Jun-99	18,636		318,507					374,416		
Jul-99	18,636		337,144					374,416		
Aug-99	18,636		355,780					374,416		
Sep-99	18,636		374,416					374,416		

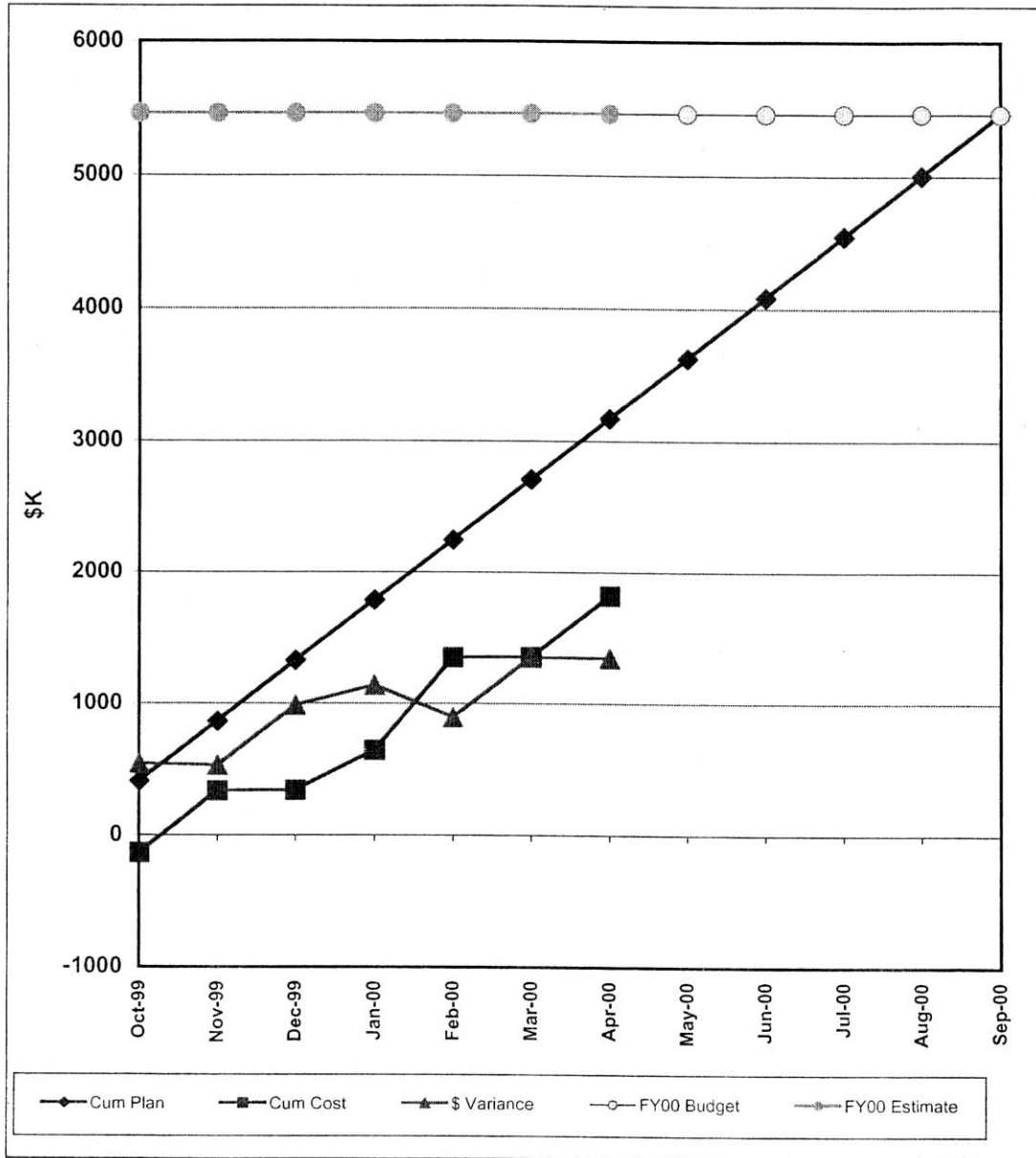
\* Rebaselining in progress will establish Project TEC BAC/EAC.

\*\* Includes \$124,820K of uncosted obligations from FY99.



**FY2000 Cost Plan to Actual  
as of March 2000  
Other Project Cost (OPC) (\$K)**

Project Number 96-D-111  
March 2000



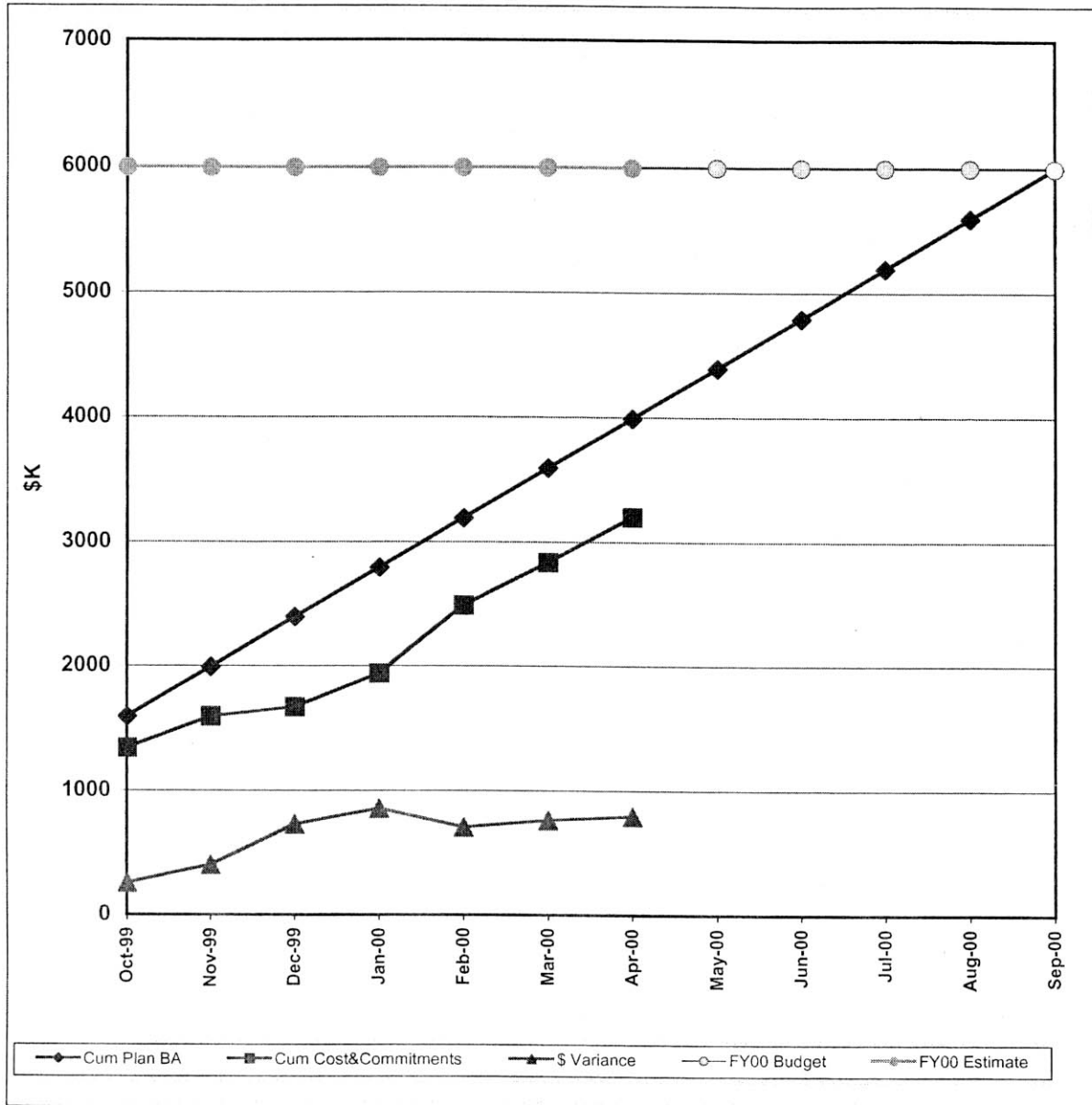
Month	Monthly		Cumulative				FY2000 Budget *	FY2000 Estimate *
	Planned	Actual	Planned	Actual	\$ Var	% Var		
Oct-99	410	-135	410	-135	545	133%	5,466	5,466
Nov-99	460	474	870	338	531	61%	5,466	5,466
Dec-99	460	4	1,329	342	987	74%	5,466	5,466
Jan-00	460	306	1,789	648	1,141	64%	5,466	5,466
Feb-00	460	705	2,248	1,353	895	40%	5,466	5,466
Mar-00	460	4	2,708	1,357	1,351	50%	5,466	5,466
Apr-00	460	463	3,168	1,821	1,347	43%	5,466	5,466
May-00	460		3,627				5,466	
Jun-00	460		4,087				5,466	
Jul-00	460		4,546				5,466	
Aug-00	460		5,006				5,466	
Sep-00	460		5,466				5,466	

\* Rebaselining in progress will establish Project OPC BAC/EAC.



**FY2000 Plan to Actual as of April 2000**  
**Other Project Cost (OPC) - Cost and Commitments (\$K)**

Project Number 96-D-111  
 April 2000



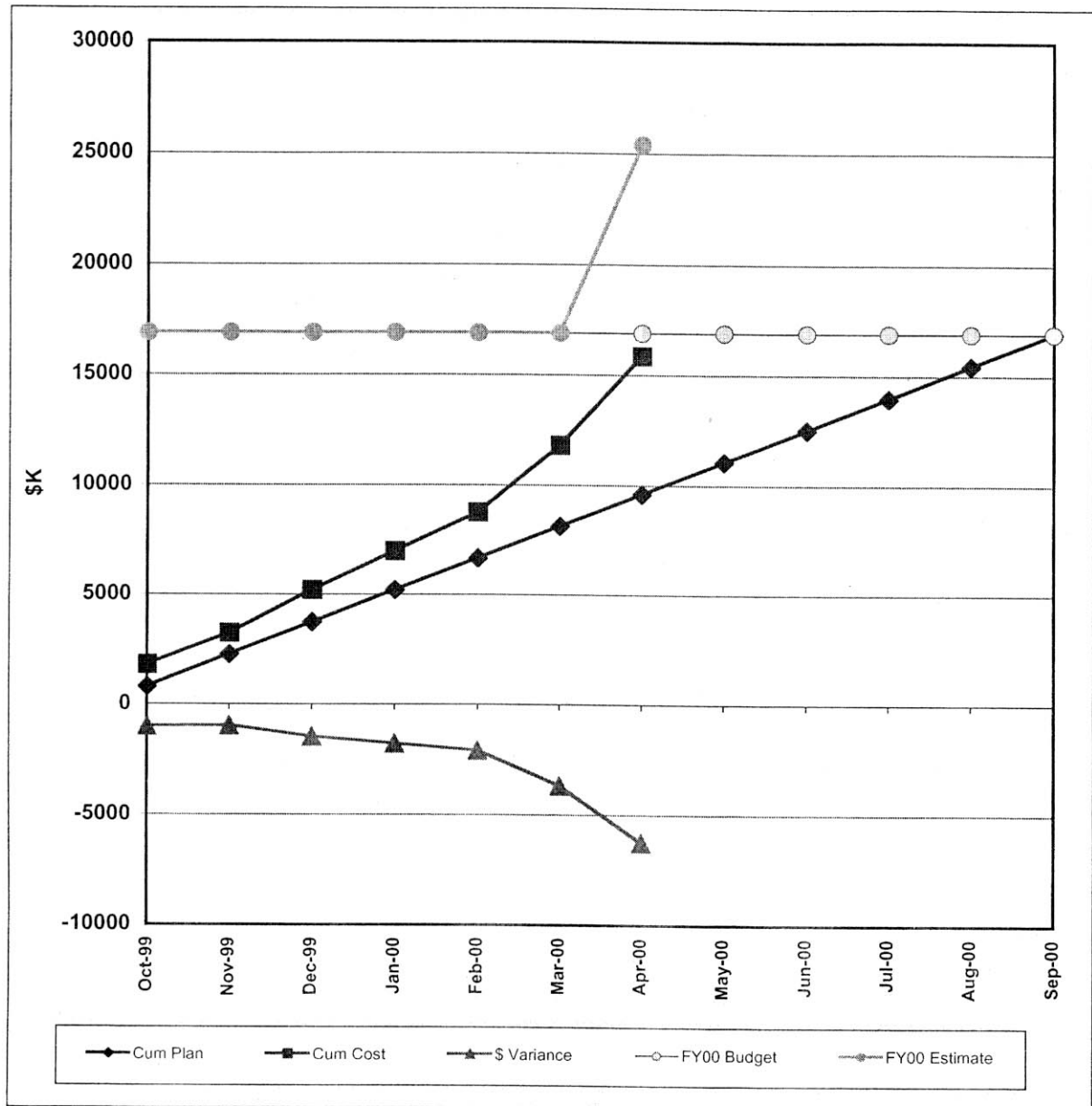
Month	Monthly		Cumulative				FY2000 Budget *	FY2000 Estimate *
	Planned	Actual	Planned	Actual	\$ Var	% Var		
Oct-99	1,592 **	1,339	1,592 **	1,339	253	16%	5,993	5,993
Nov-99	400	253	1,992	1,592	400	20%	5,993	5,993
Dec-99	400	75	2,392	1,668	724	30%	5,993	5,993
Jan-00	400	270	2,792	1,938	854	31%	5,993	5,993
Feb-00	400	549	3,192	2,487	705	22%	5,993	5,993
Mar-00	400	345	3,593	2,832	760	21%	5,993	5,993
Apr-00	400	369	3,993	3,202	791	20%	5,993	5,993
May-00	400		4,393				5,993	
Jun-00	400		4,793				5,993	
Jul-00	400		5,193				5,993	
Aug-00	400		5,593				5,993	
Sep-00	400		5,993				5,993	

\* Rebaselining in progress will establish Project OPC BAC/EAC.

\*\* Includes \$1,792K of uncostered obligations from FY99.



FY2000 Cost Plan to Actual as of April 2000  
WBS 1.1 - Project Office Cost (\$K)

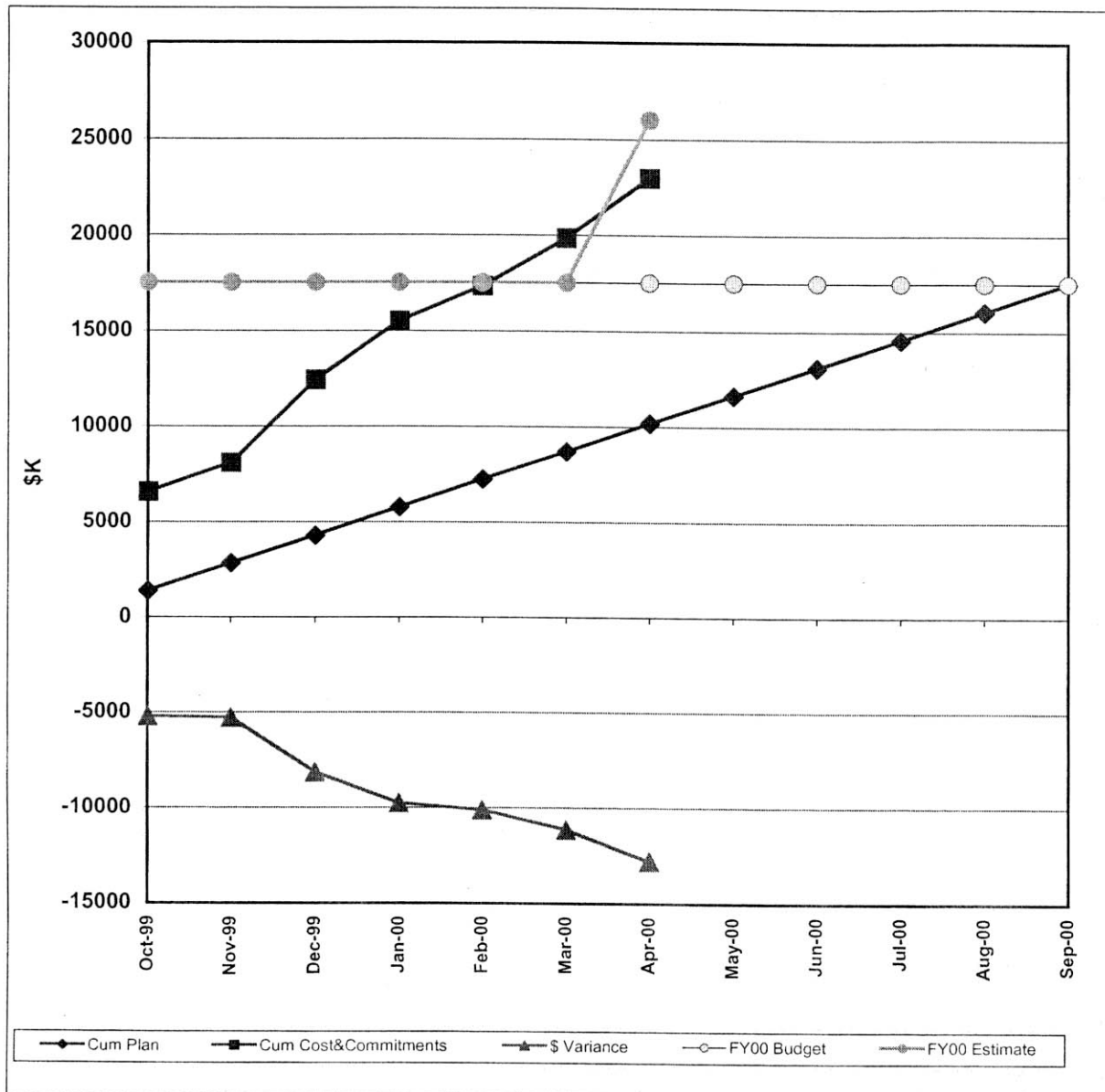


Month	Monthly		Cumulative				FY2000 Budget	FY2000 Estimate
	Planned	Actual	Planned	Actual	\$ Var	% Var		
Oct-98	821	1,812	821	1,812	-991	-121%	16,907	16,907
Nov-98	1,462	1,442	2,283	3,254	-970	-42%	16,907	16,907
Dec-98	1,462	1,943	3,746	5,197	-1,451	-39%	16,907	16,907
Jan-99	1,462	1,780	5,208	6,978	-1,769	-34%	16,907	16,907
Feb-99	1,462	1,772	6,671	8,749	-2,079	-31%	16,907	16,907
Mar-99	1,462	3,058	8,133	11,807	-3,674	-45%	16,907	16,907
Apr-99	1,462	4,055	9,595	15,862	-6,266	-65%	16,907	25,392
May-99	1,462		11,058				16,907	
Jun-99	1,462		12,520				16,907	
Jul-99	1,462		13,983				16,907	
Aug-99	1,462		15,445				16,907	
Sep-99	1,462		16,907				16,907	



**FY2000 Cost and Commitment Plan to Actual  
as of April 2000  
WBS 1.1 - Project Office (\$K)**

Project Number 96-D-111  
April 2000

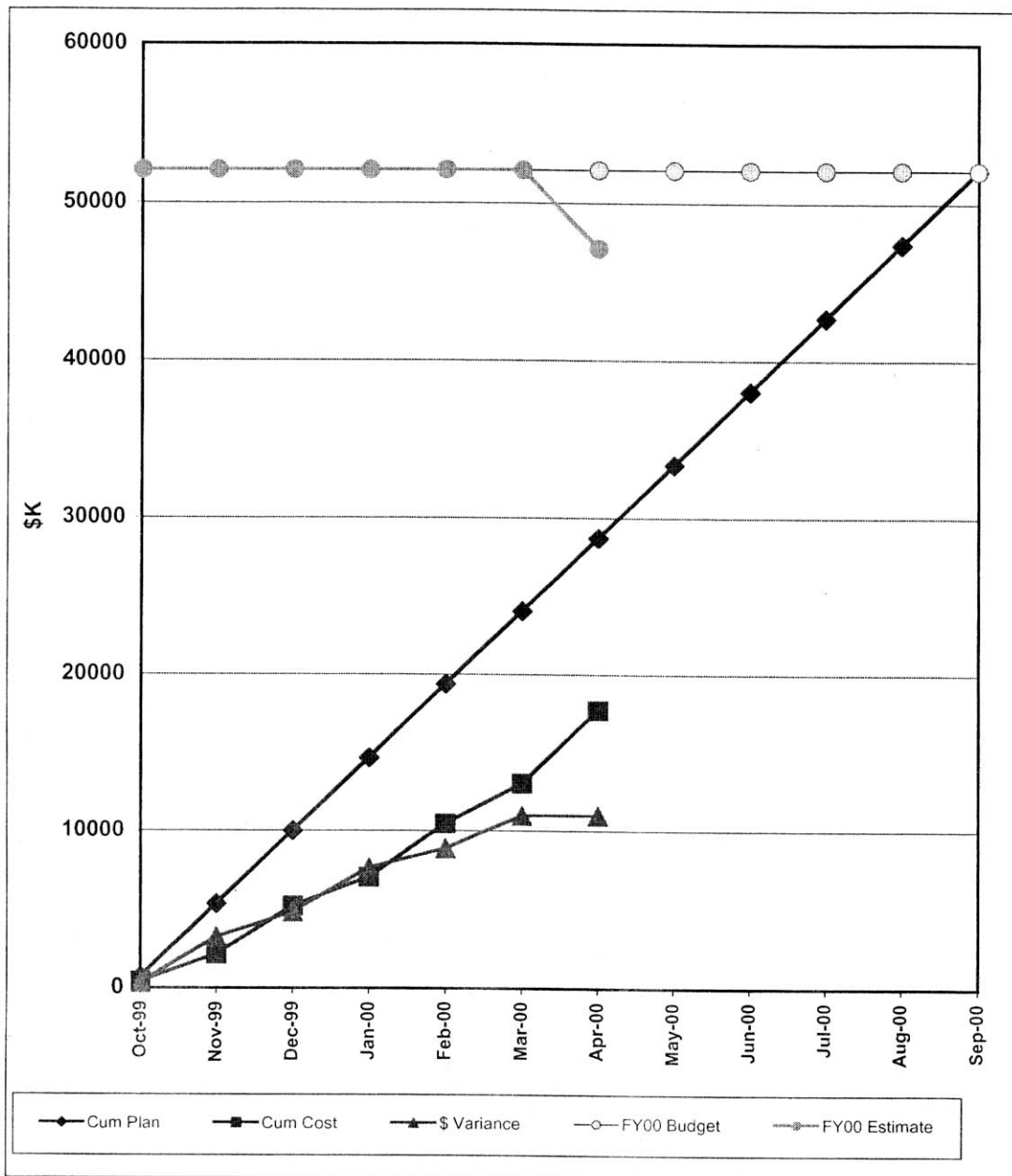


Month	Monthly		Cumulative				FY2000 Budget	FY2000 Estimate
	Planned	Actual	Planned	Actual	\$ Var	% Var		
Oct-98	1,358 *	6,571	1,358 *	6,571	-5,213	-384%	17,537	17,537
Nov-98	1,471	1,531	2,829	8,103	-5,274	-186%	17,537	17,537
Dec-98	1,471	4,346	4,300	12,449	-8,149	-190%	17,537	17,537
Jan-99	1,471	3,092	5,770	15,541	-9,771	-169%	17,537	17,537
Feb-99	1,471	1,830	7,241	17,371	-10,130	-140%	17,537	17,537
Mar-99	1,471	2,498	8,712	19,869	-11,157	-128%	17,537	17,537
Apr-99	1,471	3,123	10,183	22,992	-12,809	-126%	17,537	25,996
May-99	1,471		11,654				17,537	
Jun-99	1,471		13,124				17,537	
Jul-99	1,471		14,595				17,537	
Aug-99	1,471		16,066				17,537	
Sep-99	1,471		17,537				17,537	

\* Includes \$4,263K of uncosted obligations from FY99.



FY2000 Cost Plan to Actual as of April 2000  
WBS 1.2 - Site and Conventional  
Facilities Cost (\$K)

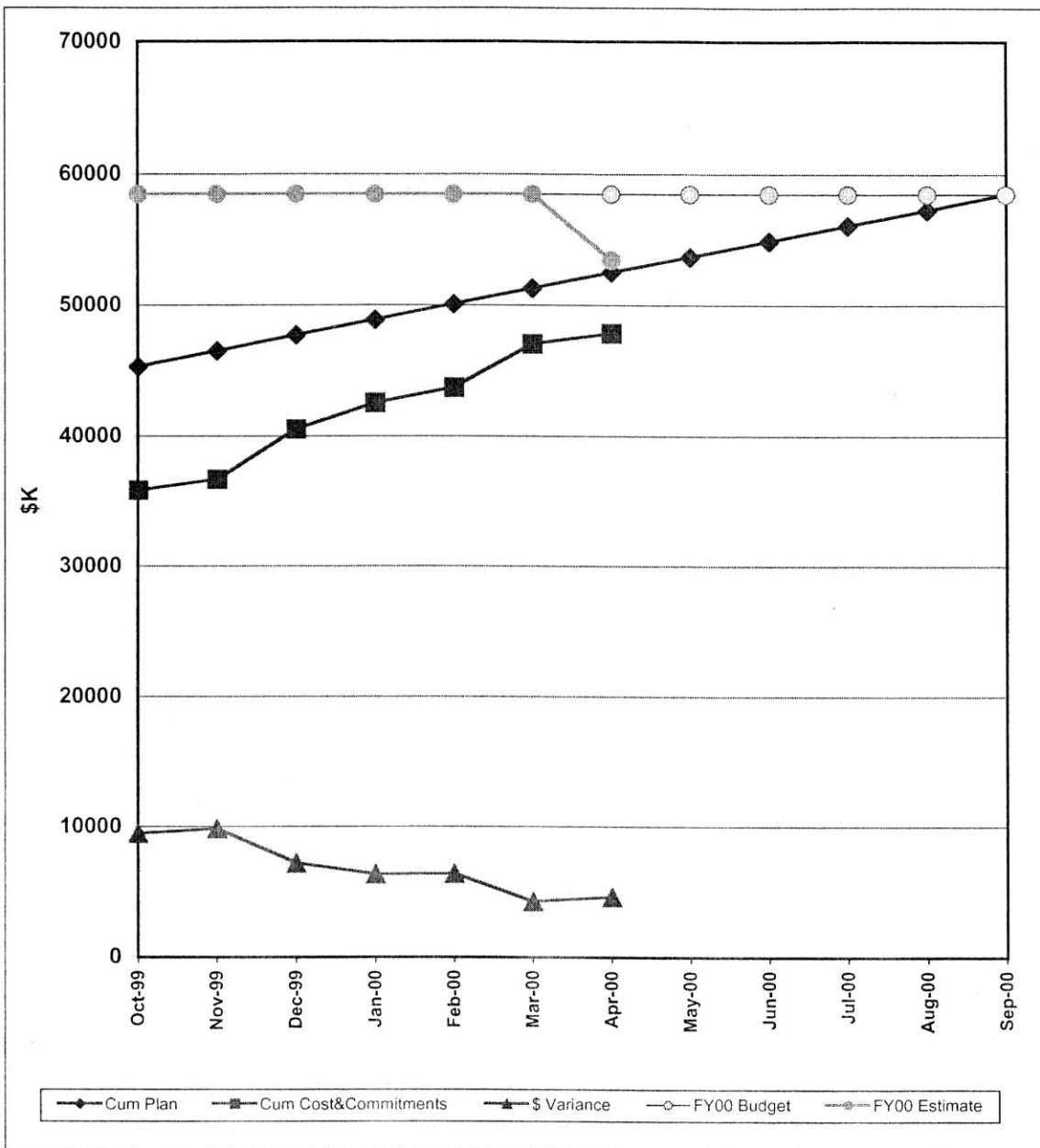


Month	Monthly		Cumulative				FY2000 Budget	FY2000 Estimate
	Planned	Actual	Planned	Actual	\$ Var	% Var		
Oct-98	664	363	664	363	301	45%	52,090	52,090
Nov-98	4,675	1,767	5,339	2,130	3,209	60%	52,090	52,090
Dec-98	4,675	3,057	10,014	5,187	4,827	48%	52,090	52,090
Jan-99	4,675	1,852	14,689	7,040	7,650	52%	52,090	52,090
Feb-99	4,675	3,442	19,364	10,481	8,883	46%	52,090	52,090
Mar-99	4,675	2,568	24,040	13,049	10,991	46%	52,090	52,090
Apr-99	4,675	4,659	28,715	17,708	11,007	38%	52,090	47,090
May-99	4,675		33,390				52,090	
Jun-99	4,675		38,065				52,090	
Jul-99	4,675		42,740				52,090	
Aug-99	4,675		47,415				52,090	
Sep-99	4,675		52,090				52,090	



**FY2000 Cost and Commitment Plan to Actual  
as of April 2000  
WBS 1.2 - Site and Conventional Facilities (\$K)**

Project Number 96-D-111  
April 2000



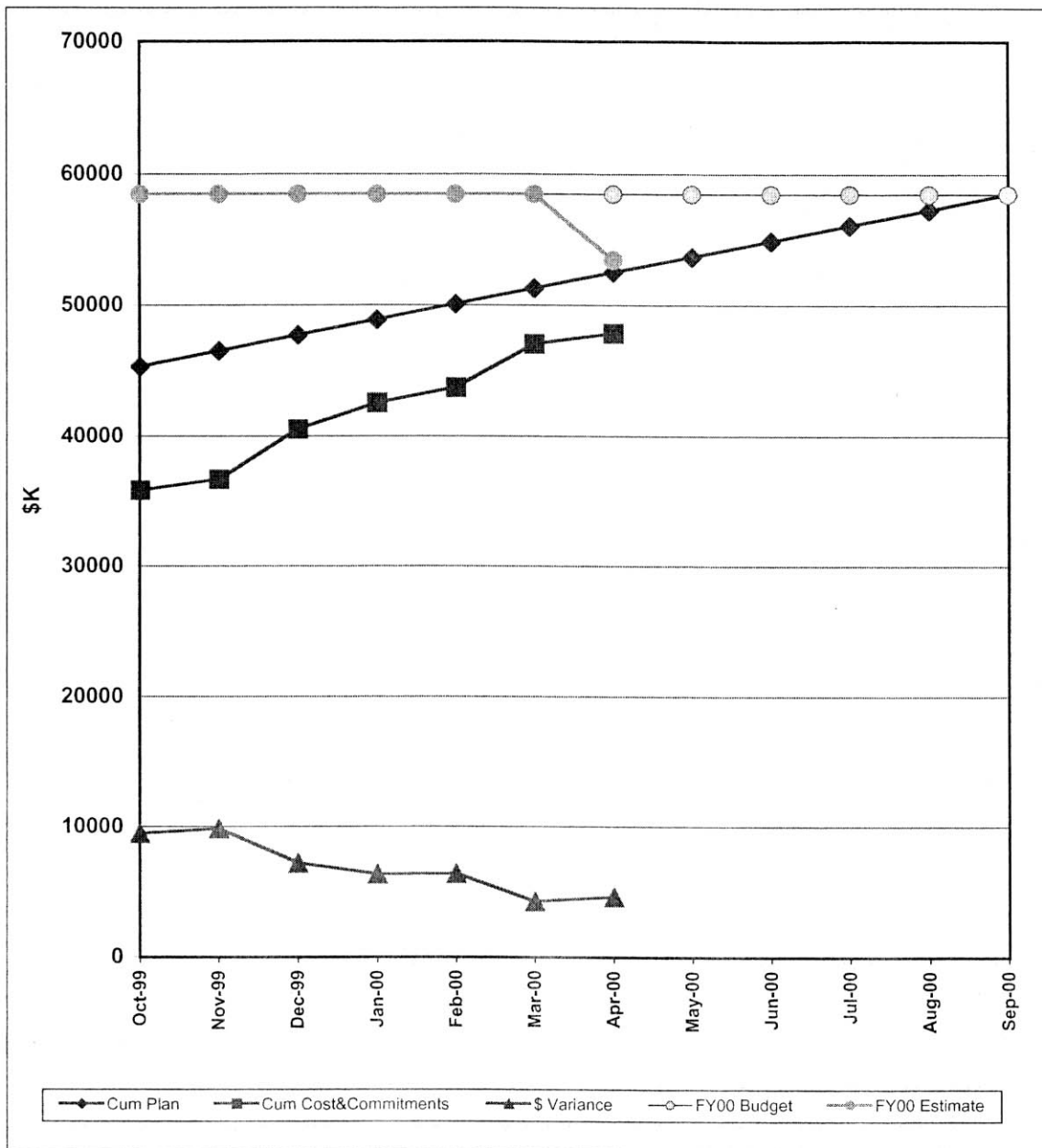
Month	Monthly		Cumulative				FY2000 Budget	FY2000 Estimate
	Planned	Actual	Planned	Actual	\$ Var	% Var		
Oct-98	45,320 *	35,825	45,320 *	35,825	9,495	21%	58,466	58,466
Nov-98	1,195	860	46,515	36,685	9,830	21%	58,466	58,466
Dec-98	1,195	3,842	47,710	40,527	7,184	15%	58,466	58,466
Jan-99	1,195	2,016	48,905	42,543	6,363	13%	58,466	58,466
Feb-99	1,195	1,143	50,100	43,685	6,415	13%	58,466	58,466
Mar-99	1,195	3,372	51,296	47,057	4,239	8%	58,466	58,466
Apr-99	1,195	809	52,491	47,866	4,625	9%	58,466	53,466
May-99	1,195		53,686				58,466	
Jun-99	1,195		54,881				58,466	
Jul-99	1,195		56,076				58,466	
Aug-99	1,195		57,271				58,466	
Sep-99	1,195		58,466				58,466	

\* Includes \$34,968K of uncosted obligations from FY99.



**FY2000 Cost and Commitment Plan to Actual  
as of April 2000  
WBS 1.2 - Site and Conventional Facilities (\$K)**

Project Number 96-D-111  
April 2000

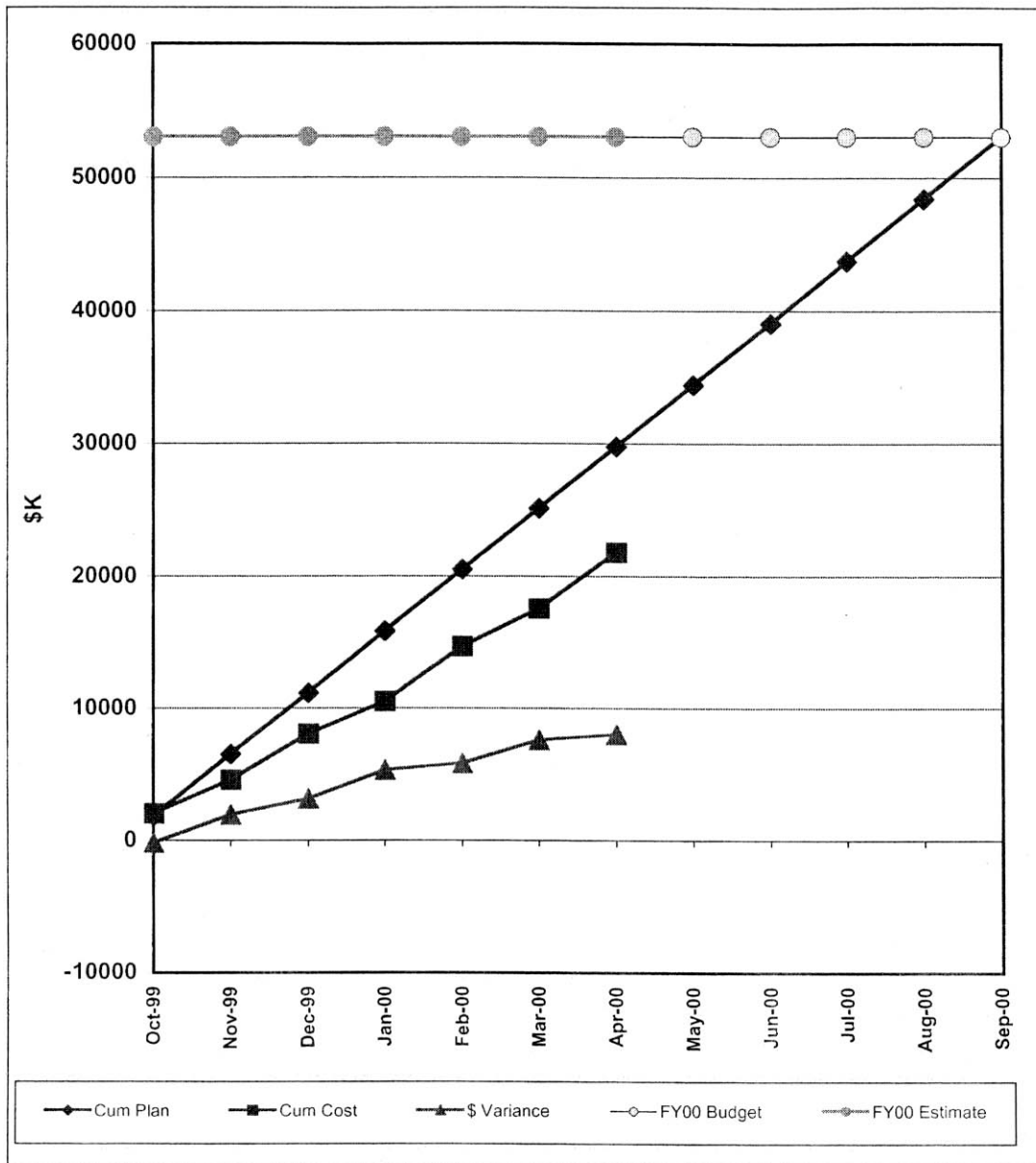


Month	Monthly		Cumulative				FY2000 Budget	FY2000 Estimate
	Planned	Actual	Planned	Actual	\$ Var	% Var		
Oct-98	45,320 *	35,825	45,320 *	35,825	9,495	21%	58,466	58,466
Nov-98	1,195	860	46,515	36,685	9,830	21%	58,466	58,466
Dec-98	1,195	3,842	47,710	40,527	7,184	15%	58,466	58,466
Jan-99	1,195	2,016	48,905	42,543	6,363	13%	58,466	58,466
Feb-99	1,195	1,143	50,100	43,685	6,415	13%	58,466	58,466
Mar-99	1,195	3,372	51,296	47,057	4,239	8%	58,466	58,466
Apr-99	1,195	809	52,491	47,866	4,625	9%	58,466	53,466
May-99	1,195		53,686				58,466	
Jun-99	1,195		54,881				58,466	
Jul-99	1,195		56,076				58,466	
Aug-99	1,195		57,271				58,466	
Sep-99	1,195		58,466				58,466	

\* Includes \$34,968K of uncosted obligations from FY99.



**FY2000 Cost Plan to Actual  
as of April 2000  
WBS 1.3 - Lasers Systems (\$K)**

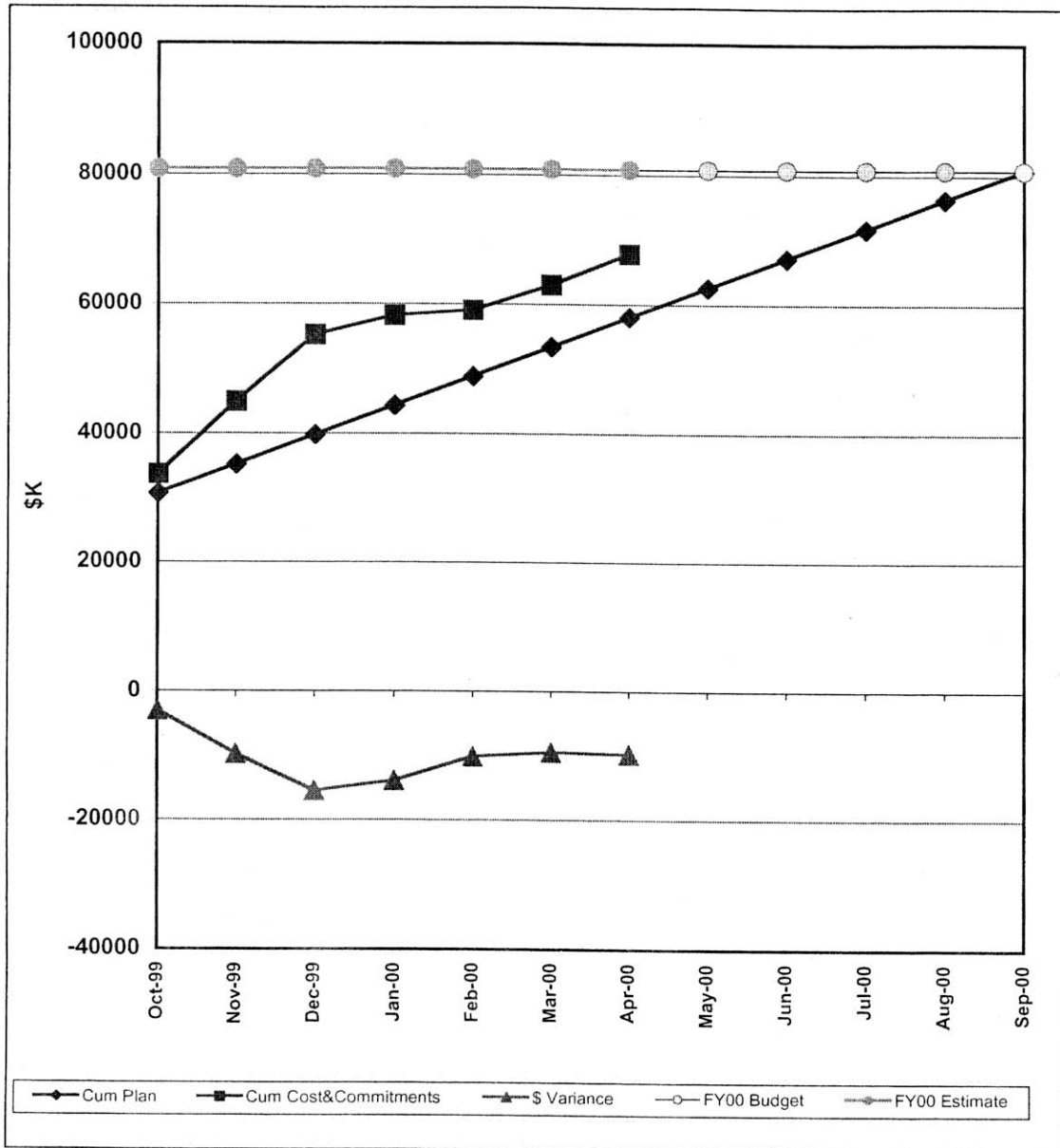


Month	Monthly		Cumulative				FY2000 Budget	FY2000 Estimate
	Planned	Actual	Planned	Actual	\$ Var	% Var		
Oct-98	1,849	2,050	1,849	2,050	-201	-11%	53,083	53,083
Nov-98	4,658	2,517	6,507	4,567	1,939	30%	53,083	53,083
Dec-98	4,658	3,455	11,164	8,023	3,142	28%	53,083	53,083
Jan-99	4,658	2,463	15,822	10,485	5,336	34%	53,083	53,083
Feb-99	4,658	4,157	20,479	14,642	5,837	29%	53,083	53,083
Mar-99	4,658	2,904	25,137	17,546	7,591	30%	53,083	53,083
Apr-99	4,658	4,239	29,795	21,785	8,010	27%	53,083	53,083
May-99	4,658		34,452				53,083	
Jun-99	4,658		39,110				53,083	
Jul-99	4,658		43,767				53,083	
Aug-99	4,658		48,425				53,083	
Sep-99	4,658		53,083				53,083	



**FY2000 Cost and Commitment Plan to Actual  
as of April 2000  
WBS 1.3 - Lasers Systems (\$K)**

Project Number 96-D-111  
April 2000



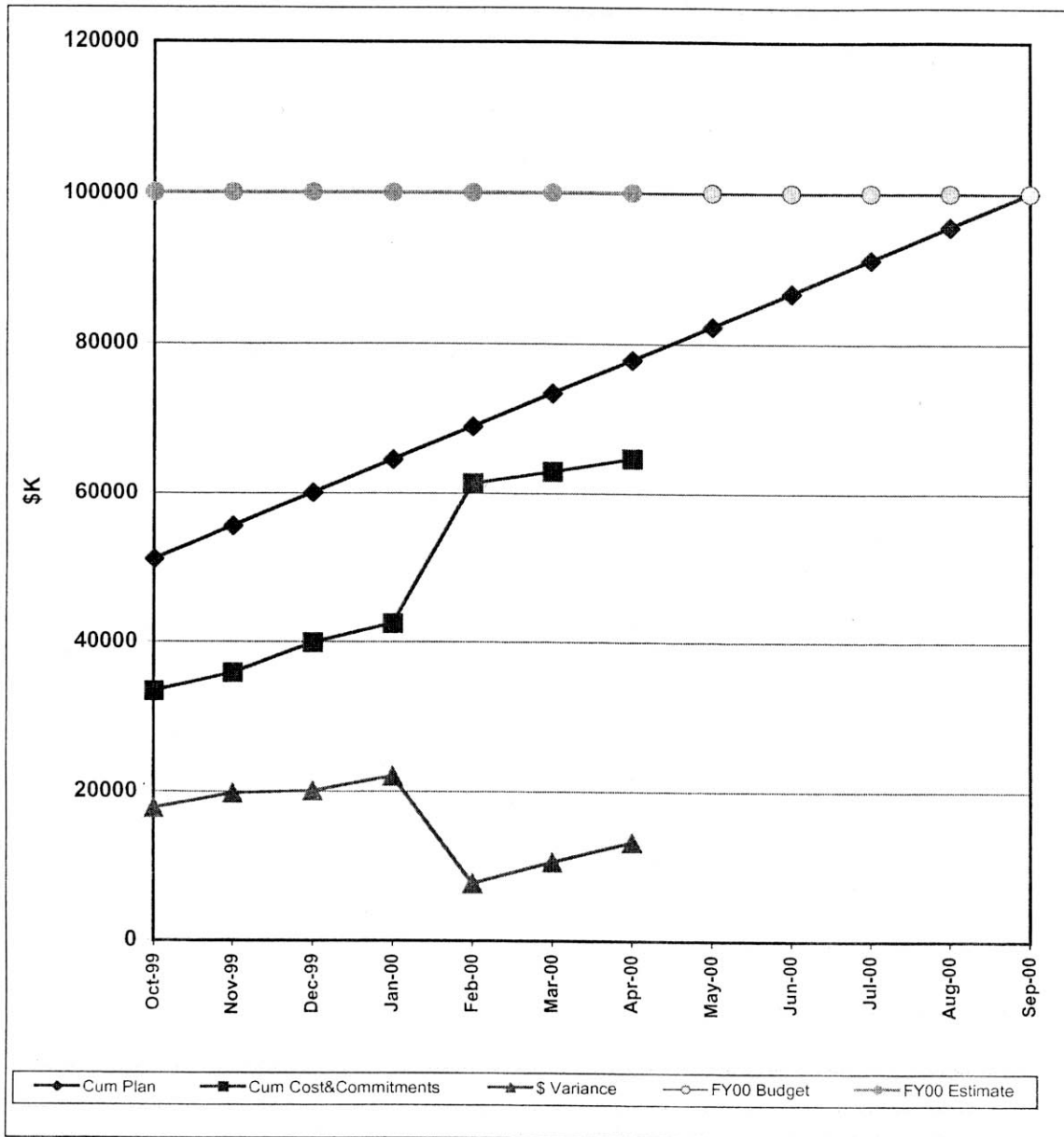
Month	Monthly		Cumulative				FY2000 Budget	FY2000 Estimate
	Planned	Actual	Planned	Actual	\$ Var	% Var		
Oct-98	30,661 *	33,683	30,661 *	33,683	-3,022	-10%	80,840	80,840
Nov-98	4,562	11,269	35,223	44,952	-9,729	-28%	80,840	80,840
Dec-98	4,562	10,316	39,784	55,268	-15,484	-39%	80,840	80,840
Jan-99	4,562	2,990	44,346	58,259	-13,912	-31%	80,840	80,840
Feb-99	4,562	775	48,908	59,033	-10,125	-21%	80,840	80,840
Mar-99	4,562	3,947	53,470	62,980	-9,511	-18%	80,840	80,840
Apr-99	4,562	4,838	58,031	67,818	-9,787	-17%	80,840	80,840
May-99	4,562		62,593				80,840	
Jun-99	4,562		67,155				80,840	
Jul-99	4,562		71,716				80,840	
Aug-99	4,562		76,278				80,840	
Sep-99	4,562		80,840				80,840	

\* Includes \$25,645K of uncosted obligations from FY99.



**FY2000 Cost and Commitment Plan to Actual  
as of April 2000  
WBS 1.4 - BeamTransport Systems (\$K)**

Project Number 96-D-111  
April 2000



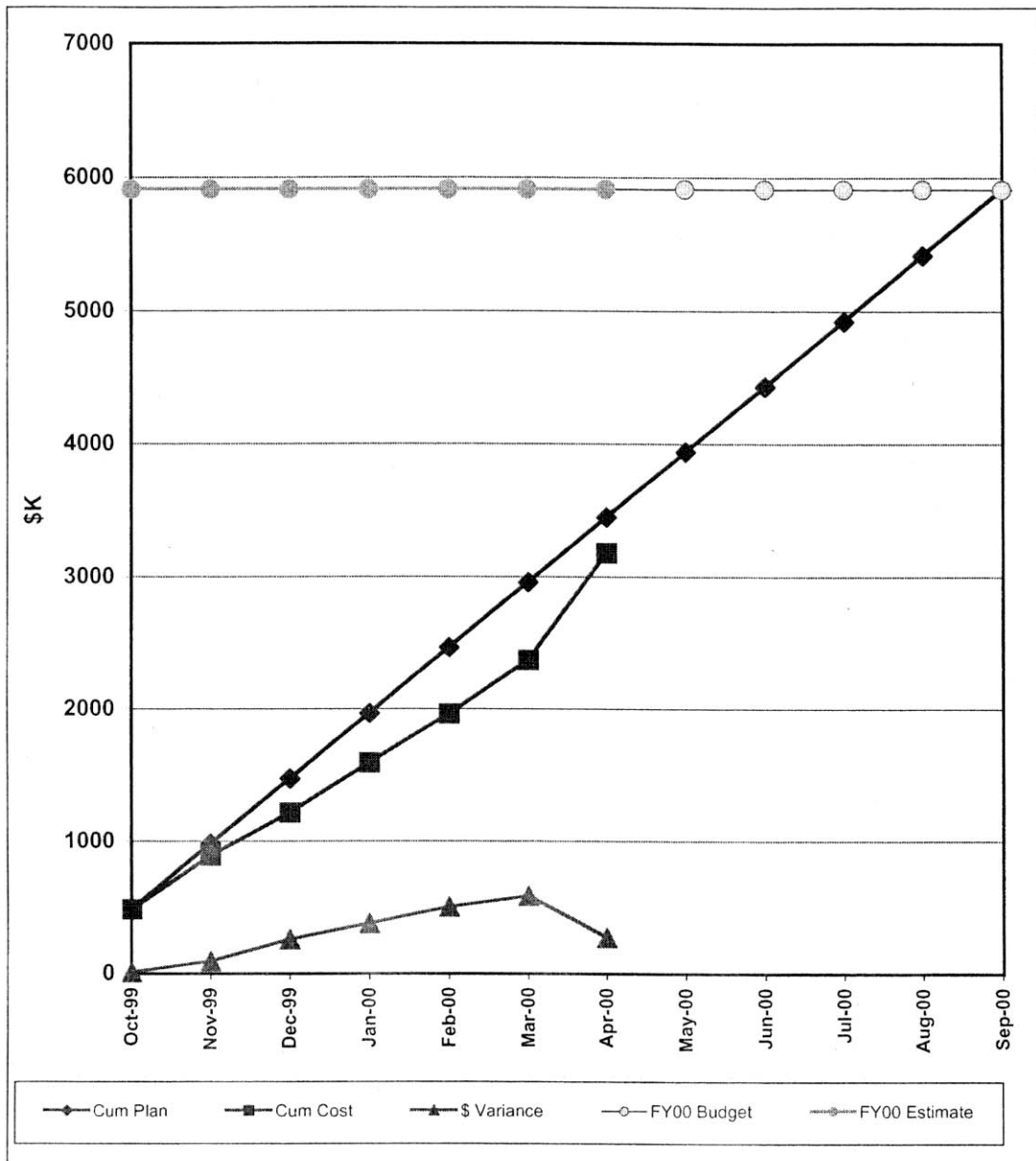
Month	Monthly		Cumulative				FY2000 Budget	FY2000 Estimate
	Planned	Actual	Planned	Actual	\$ Var	% Var		
Oct-99	51,134 *	33,394	51,134 *	33,394	17,740	35%	100,106	100,106
Nov-99	4,452	2,457	55,586	35,850	19,736	36%	100,106	100,106
Dec-99	4,452	4,109	60,038	39,960	20,078	33%	100,106	100,106
Jan-00	4,452	2,535	64,490	42,495	21,995	34%	100,106	100,106
Feb-00	4,452	18,832	68,942	61,327	7,615	11%	100,106	100,106
Mar-00	4,452	1,602	73,394	62,929	10,465	14%	100,106	100,106
Apr-00	4,452	1,725	77,846	64,654	13,192	17%	100,106	100,106
May-00	4,452		82,298				100,106	
Jun-00	4,452		86,750				100,106	
Jul-00	4,452		91,202				100,106	
Aug-00	4,452		95,654				100,106	
Sep-00	4,452		100,106				100,106	

\* Includes \$34,782K of uncosted obligations from FY99.



**FY2000 Cost Plan to Actual  
as of April 2000  
WBS 1.5 - Integrated Computer Control (\$K)**

Project Number 96-D-111  
April 2000

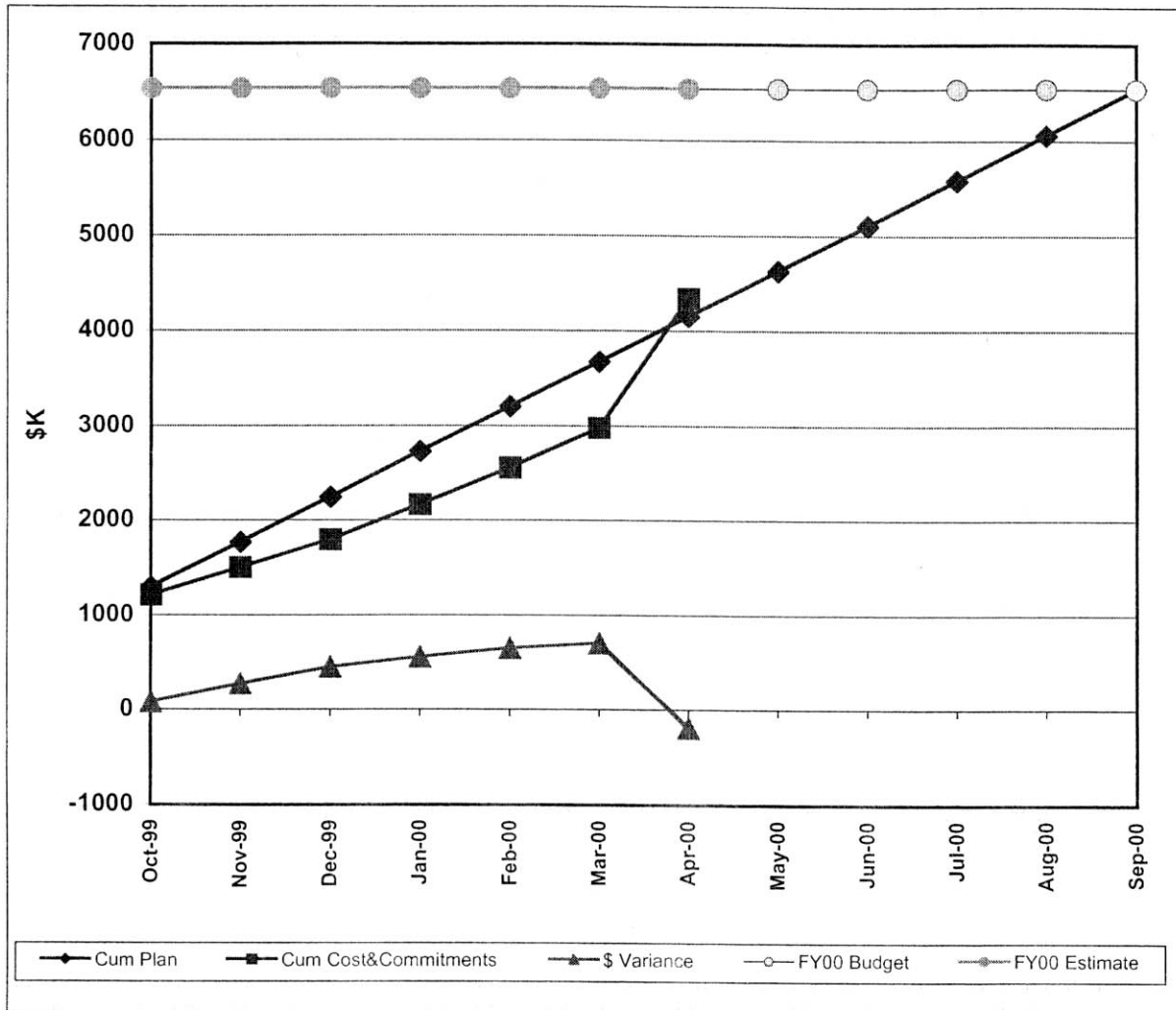


Month	Monthly		Cumulative				FY2000 Budget	FY2000 Estimate
	Planned	Actual	Planned	Actual	\$ Var	% Var		
Oct-99	489	482	489	482	7	1%	5,914	5,914
Nov-99	493	407	982	889	93	10%	5,914	5,914
Dec-99	493	328	1,475	1,217	258	17%	5,914	5,914
Jan-00	493	374	1,969	1,591	377	19%	5,914	5,914
Feb-00	493	369	2,462	1,960	502	20%	5,914	5,914
Mar-00	493	409	2,955	2,369	586	20%	5,914	5,914
Apr-00	493	809	3,448	3,178	270	8%	5,914	5,914
May-00	493		3,941				5,914	
Jun-00	493		4,435				5,914	
Jul-00	493		4,928				5,914	
Aug-00	493		5,421				5,914	
Sep-00	493		5,914				5,914	



**FY2000 Cost and Commitment Plan to Actual  
as of April 2000  
WBS 1.5 - Integrated  
Computer Control (\$K)**

Project Number 96-D-111  
April 2000



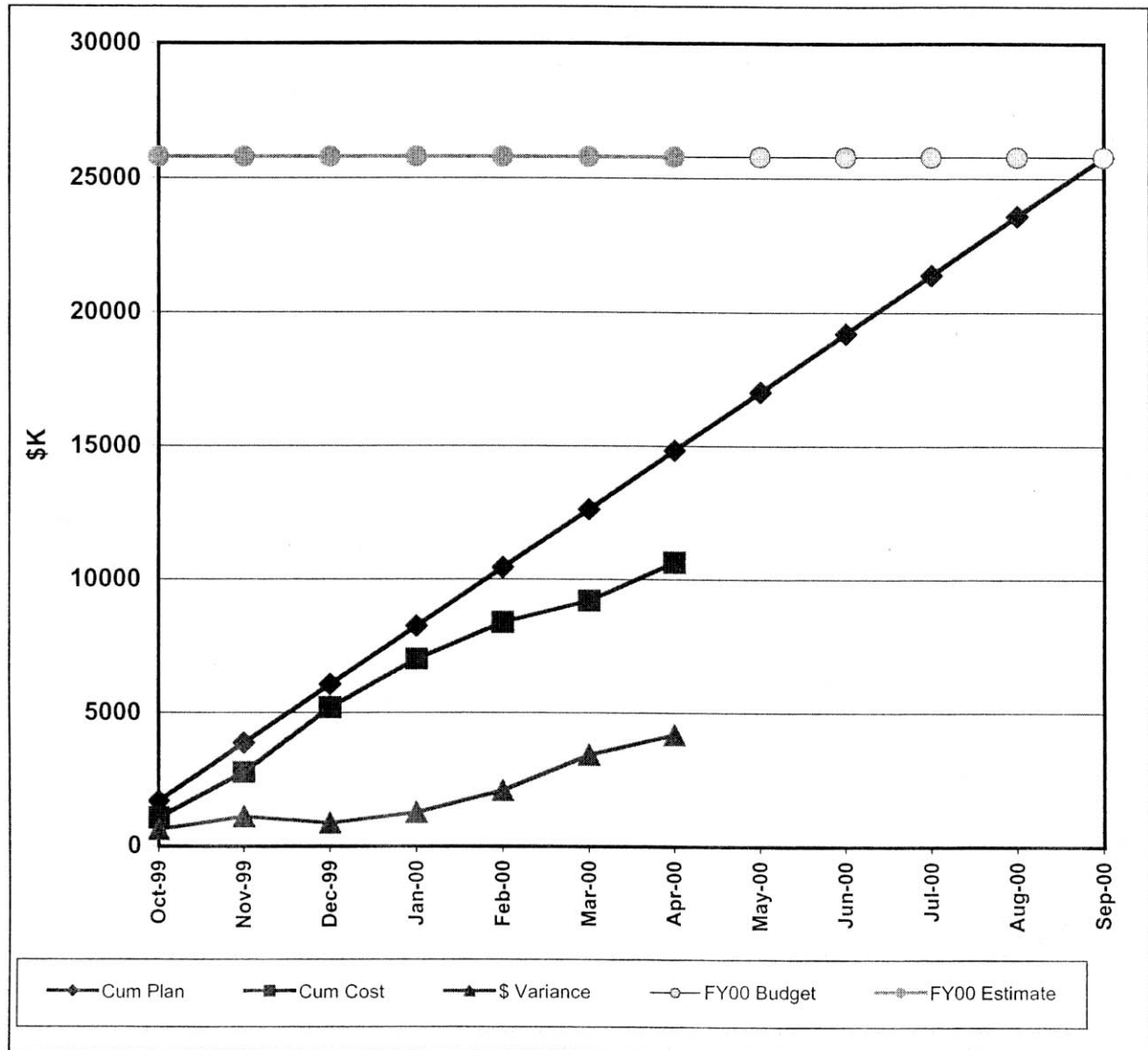
Month	Monthly		Cumulative				FY2000 Budget	FY2000 Estimate
	Planned	Actual	Planned	Actual	\$ Var	% Var		
Oct-99	1,294 *	1,211	1,294 *	1,211	83	6%	6,536	6,536
Nov-99	477	287	1,771	1,498	273	15%	6,536	6,536
Dec-99	477	299	2,247	1,797	450	20%	6,536	6,536
Jan-00	477	369	2,724	2,166	557	20%	6,536	6,536
Feb-00	477	388	3,200	2,554	646	20%	6,536	6,536
Mar-00	477	422	3,677	2,976	701	19%	6,536	6,536
Apr-00	477	1,364	4,153	4,340	-187	-5%	6,536	6,536
May-00	477		4,630				6,536	
Jun-00	477		5,106				6,536	
Jul-00	477		5,583				6,536	
Aug-00	477		6,059				6,536	
Sep-00	477		6,536				6,536	

\* Includes \$750K of uncosted obligations from FY99.



**FY2000 Cost Plan to Actual  
as of April 2000  
WBS 1.6 - Optical Components (\$K)**

Project Number 96-D-111  
April 2000

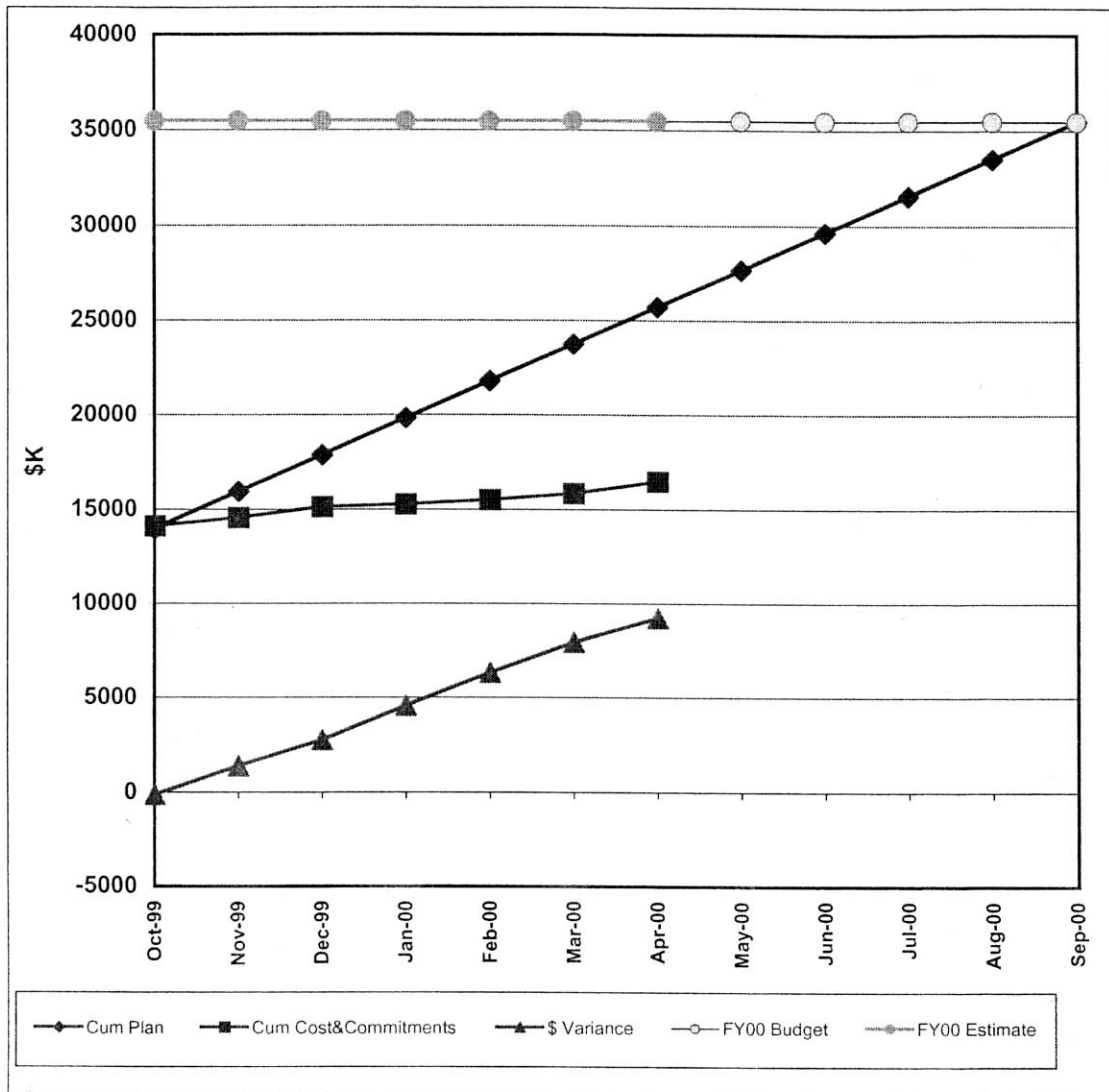


Month	Monthly		Cumulative				FY2000 Budget	FY2000 Estimate
	Planned	Actual	Planned	Actual	\$ Var	% Var		
Oct-99	1,681	1,067	1,681	1,067	614	37%	25,798	25,798
Nov-99	2,192	1,704	3,873	2,771	1,102	28%	25,798	25,798
Dec-99	2,193	2,422	6,066	5,193	873	14%	25,798	25,798
Jan-00	2,193	1,810	8,258	7,003	1,255	15%	25,798	25,798
Feb-00	2,193	1,377	10,451	8,380	2,071	20%	25,798	25,798
Mar-00	2,193	824	12,643	9,204	3,439	27%	25,798	25,798
Apr-00	2,193	1,448	14,836	10,652	4,184	28%	25,798	25,798
May-00	2,193		17,028				25,798	
Jun-00	2,193		19,221				25,798	
Jul-00	2,193		21,413				25,798	
Aug-00	2,193		23,606				25,798	
Sep-00	2,193		25,798				25,798	



**FY2000 Cost and Commitment Plan to Actual  
as of April 2000  
WBS 1.6 - Optical Components (\$K)**

Project Number 96-D-111  
April 2000



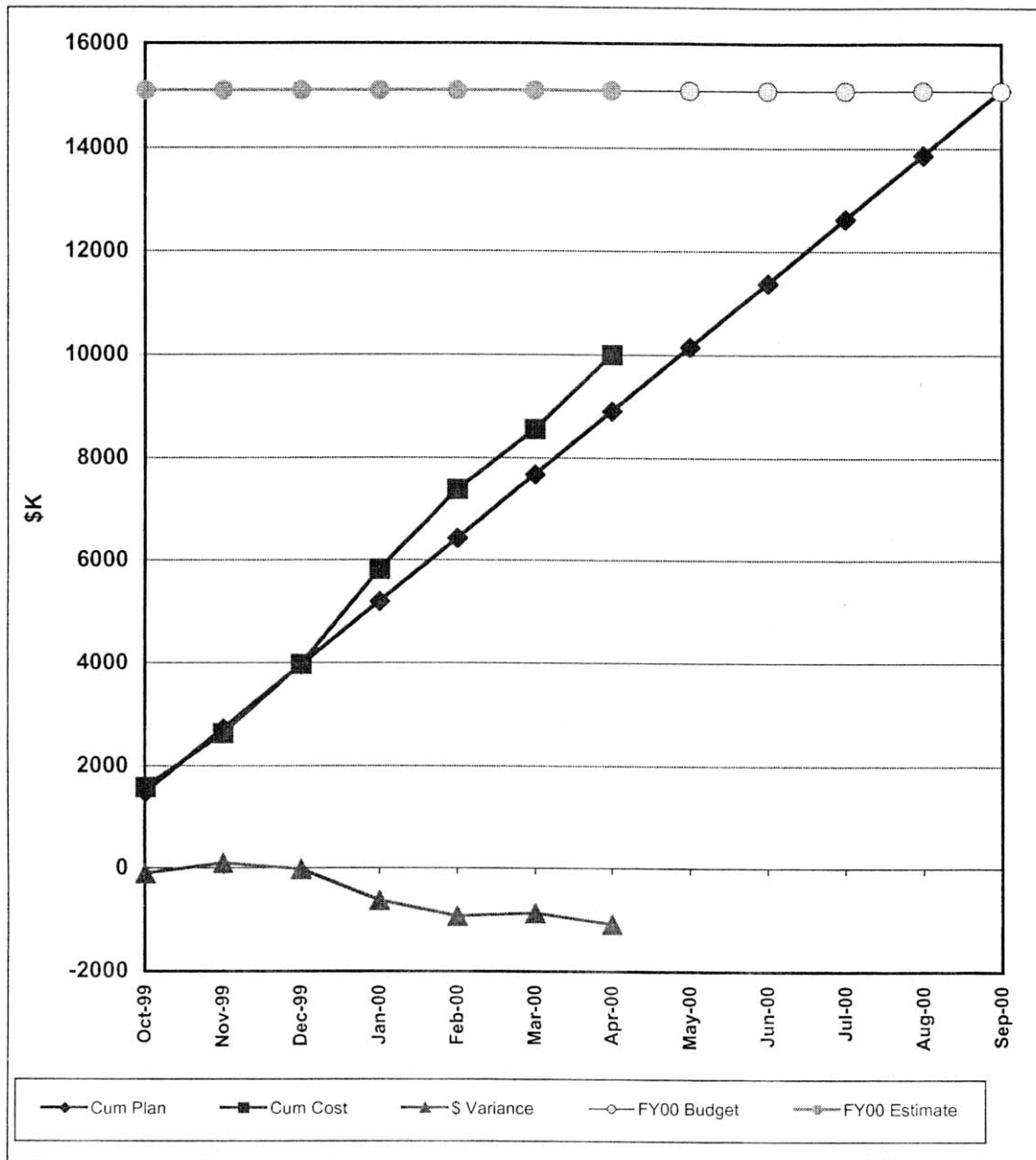
Month	Monthly		Cumulative				FY2000 Budget	FY2000 Estimate
	Planned	Actual	Planned	Actual	\$ Var	% Var		
Oct-99	13,984 *	14,124	13,984 *	14,124	-140	-1%	35,473	35,473
Nov-99	1,954	441	15,938	14,565	1,373	9%	35,473	35,473
Dec-99	1,954	570	17,891	15,135	2,756	15%	35,473	35,473
Jan-00	1,954	131	19,845	15,266	4,579	23%	35,473	35,473
Feb-00	1,954	223	21,798	15,489	6,309	29%	35,473	35,473
Mar-00	1,954	326	23,752	15,815	7,937	33%	35,473	35,473
Apr-00	1,954	657	25,705	16,472	9,233	36%	35,473	35,473
May-00	1,954		27,659				35,473	
Jun-00	1,954		29,612				35,473	
Jul-00	1,954		31,566				35,473	
Aug-00	1,954		33,519				35,473	
Sep-00	1,954		35,473				35,473	

\* Includes \$12,620K of uncosted obligations from FY99.



**FY2000 Cost Plan to Actual as of April 2000**  
**WBS 1.7 - Laser Control (\$K)**

Project Number 96-D-111  
 April 2000

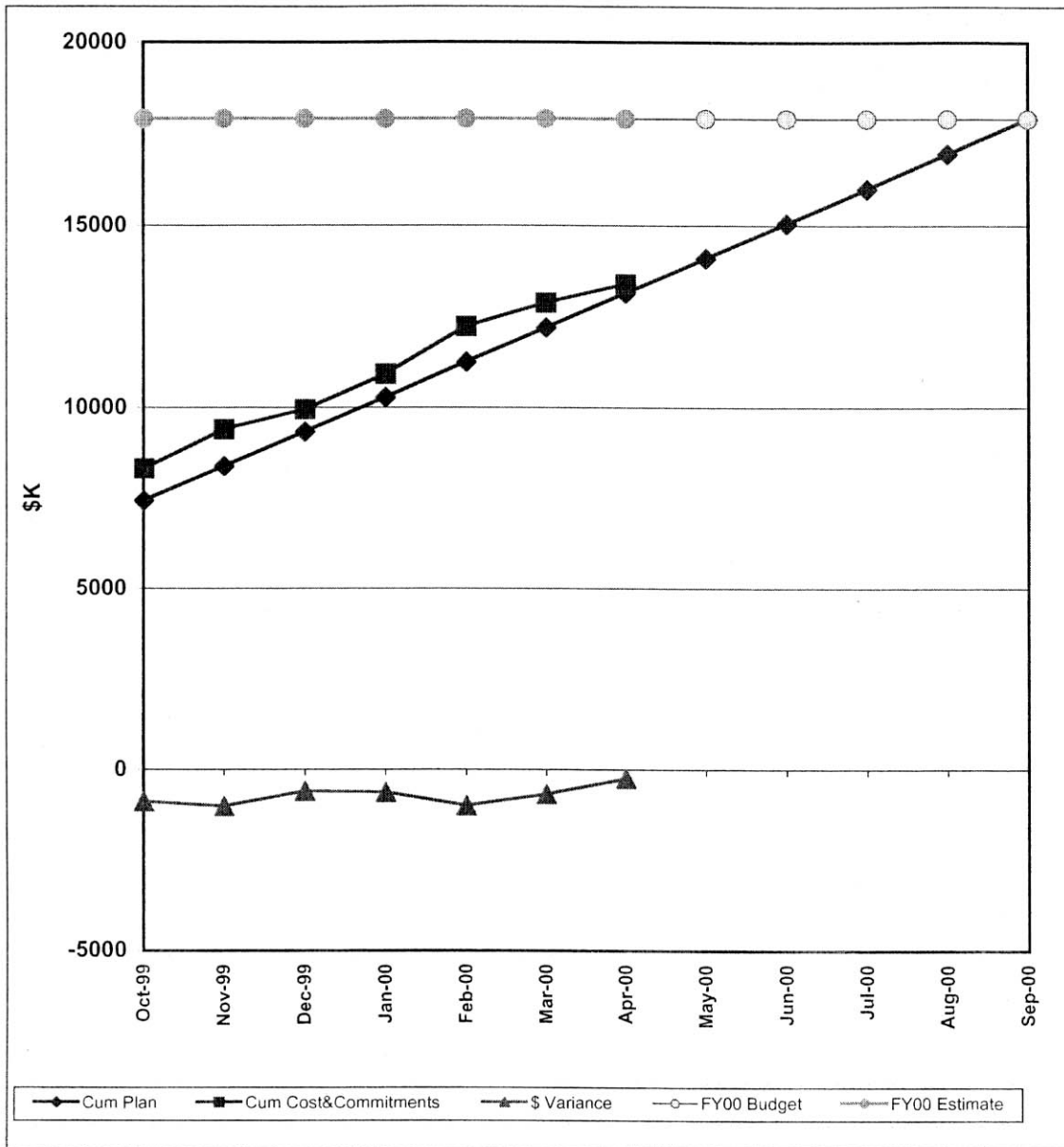


Month	Monthly		Cumulative				FY2000 Budget	FY2000 Estimate
	Planned	Actual	Planned	Actual	\$ Var	% Var		
Oct-99	1,483	1,582	1,483	1,582	-99	-7%	15,103	15,103
Nov-99	1,238	1,042	2,721	2,625	97	4%	15,103	15,103
Dec-99	1,238	1,351	3,959	3,976	-17	0%	15,103	15,103
Jan-00	1,238	1,851	5,198	5,827	-629	-12%	15,103	15,103
Feb-00	1,238	1,547	6,436	7,374	-938	-15%	15,103	15,103
Mar-00	1,238	1,176	7,674	8,550	-876	-11%	15,103	15,103
Apr-00	1,238	1,449	8,912	9,999	-1,087	-12%	15,103	15,103
May-00	1,238		10,150				15,103	
Jun-00	1,238		11,389				15,103	
Jul-00	1,238		12,627				15,103	
Aug-00	1,238		13,865				15,103	
Sep-00	1,238		15,103				15,103	



**FY2000 Cost and Commitment Plan to Actual  
as of April 2000  
WBS 1.7 - Laser Control (\$K)**

Project Number 96-D-111  
April 2000



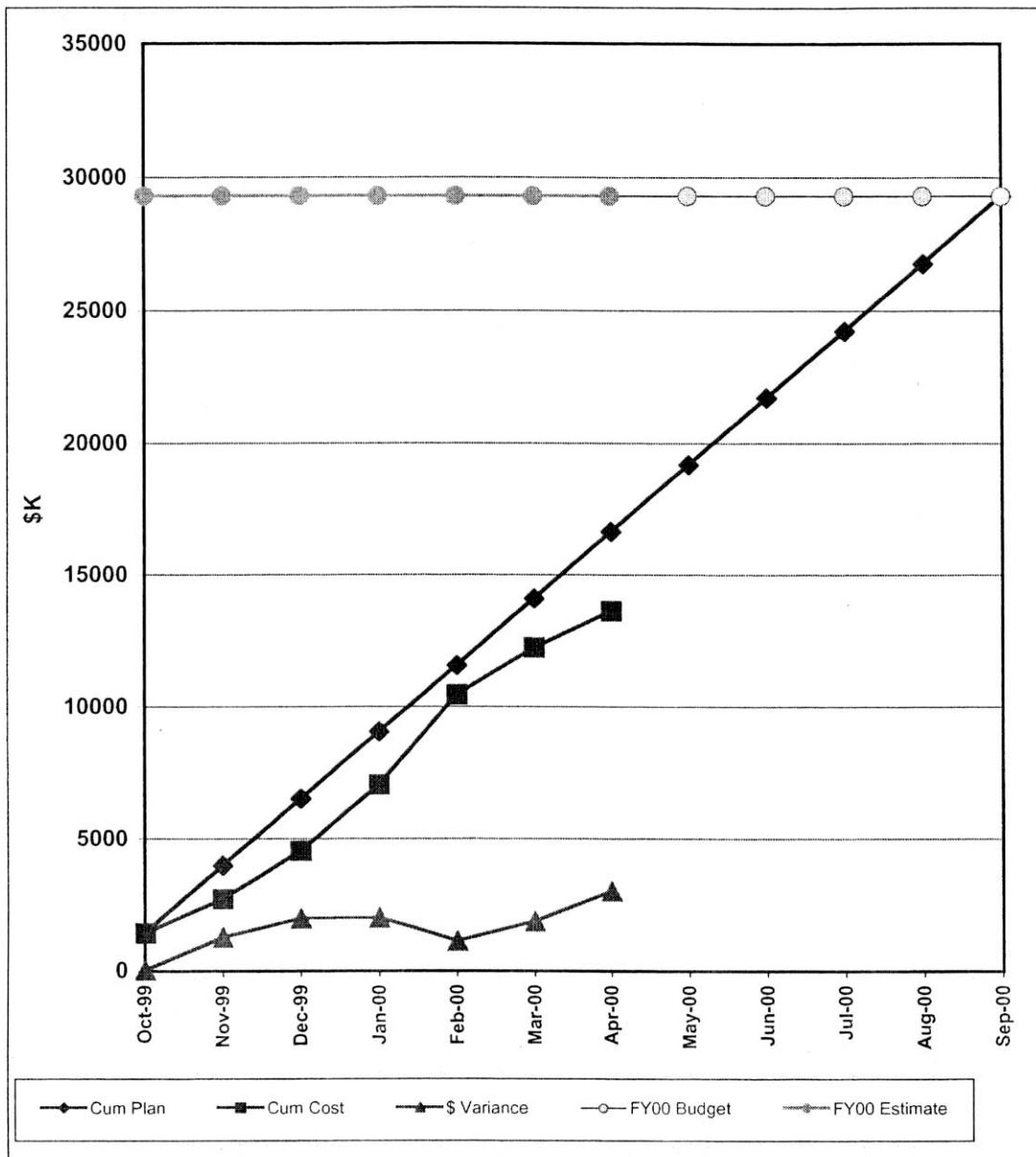
Month	Monthly		Cumulative				FY2000 Budget	FY2000 Estimate
	Planned	Actual	Planned	Actual	\$ Var	% Var		
Oct-99	7,429 *	8,309	7,429 *	8,309	-880	-12%	17,914	17,914
Nov-99	953	1,089	8,382	9,398	-1,016	-12%	17,914	17,914
Dec-99	953	544	9,335	9,942	-607	-6%	17,914	17,914
Jan-00	953	982	10,289	10,924	-636	-6%	17,914	17,914
Feb-00	953	1,312	11,242	12,236	-994	-9%	17,914	17,914
Mar-00	953	641	12,195	12,877	-682	-6%	17,914	17,914
Apr-00	953	525	13,148	13,402	-253	-2%	17,914	17,914
May-00	953		14,101				17,914	
Jun-00	953		15,055				17,914	
Jul-00	953		16,008				17,914	
Aug-00	953		16,961				17,914	
Sep-00	953		17,914				17,914	

\* Includes \$4,136K of uncosted obligations from FY99.



**FY2000 Cost Plan to Actual  
as of April 2000  
WBS 1.8 - Target Experimental System (\$K)**

Project Number 96-D-111  
April 2000

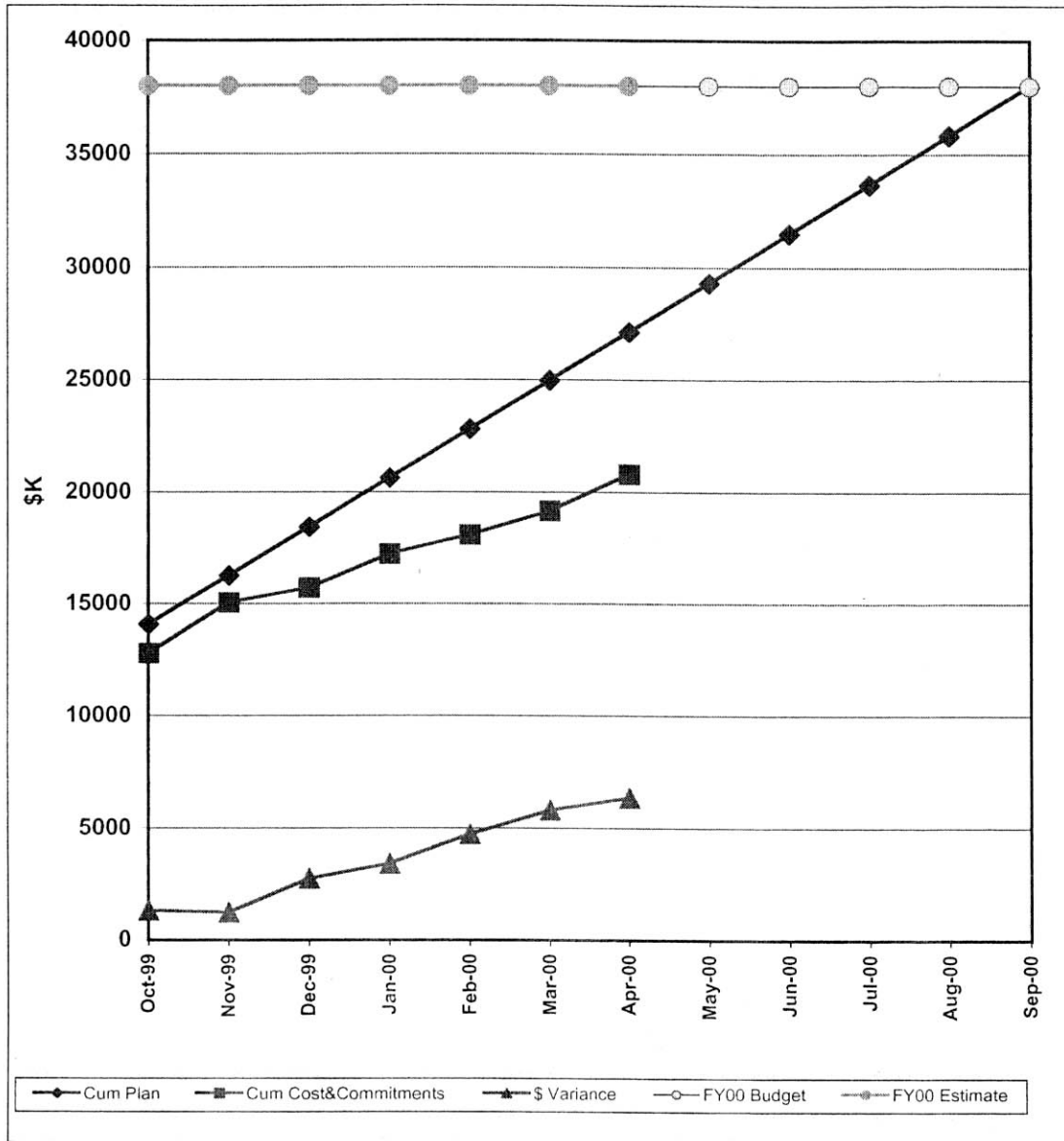


Month	Monthly		Cumulative				FY2000 Budget	FY2000 Estimate
	Planned	Actual	Planned	Actual	\$ Var	% Var		
Oct-99	1,458	1,429	1,458	1,429	29	2%	29,303	29,303
Nov-99	2,531	1,296	3,989	2,725	1,264	32%	29,303	29,303
Dec-99	2,531	1,806	6,521	4,531	1,990	31%	29,303	29,303
Jan-00	2,531	2,521	9,052	7,052	2,000	22%	29,303	29,303
Feb-00	2,531	3,410	11,584	10,462	1,122	10%	29,303	29,303
Mar-00	2,531	1,782	14,115	12,243	1,872	13%	29,303	29,303
Apr-00	2,531	1,373	16,646	13,616	3,030	18%	29,303	29,303
May-00	2,531		19,178				29,303	
Jun-00	2,531		21,709				29,303	
Jul-00	2,531		24,241				29,303	
Aug-00	2,531		26,772				29,303	
Sep-00	2,531		29,303				29,303	



**FY2000 Cost and Commitment Plan to Actual  
as of April 2000  
WBS 1.8 - Target Experimental System (\$K)**

Project Number 96-D-111  
April 2000



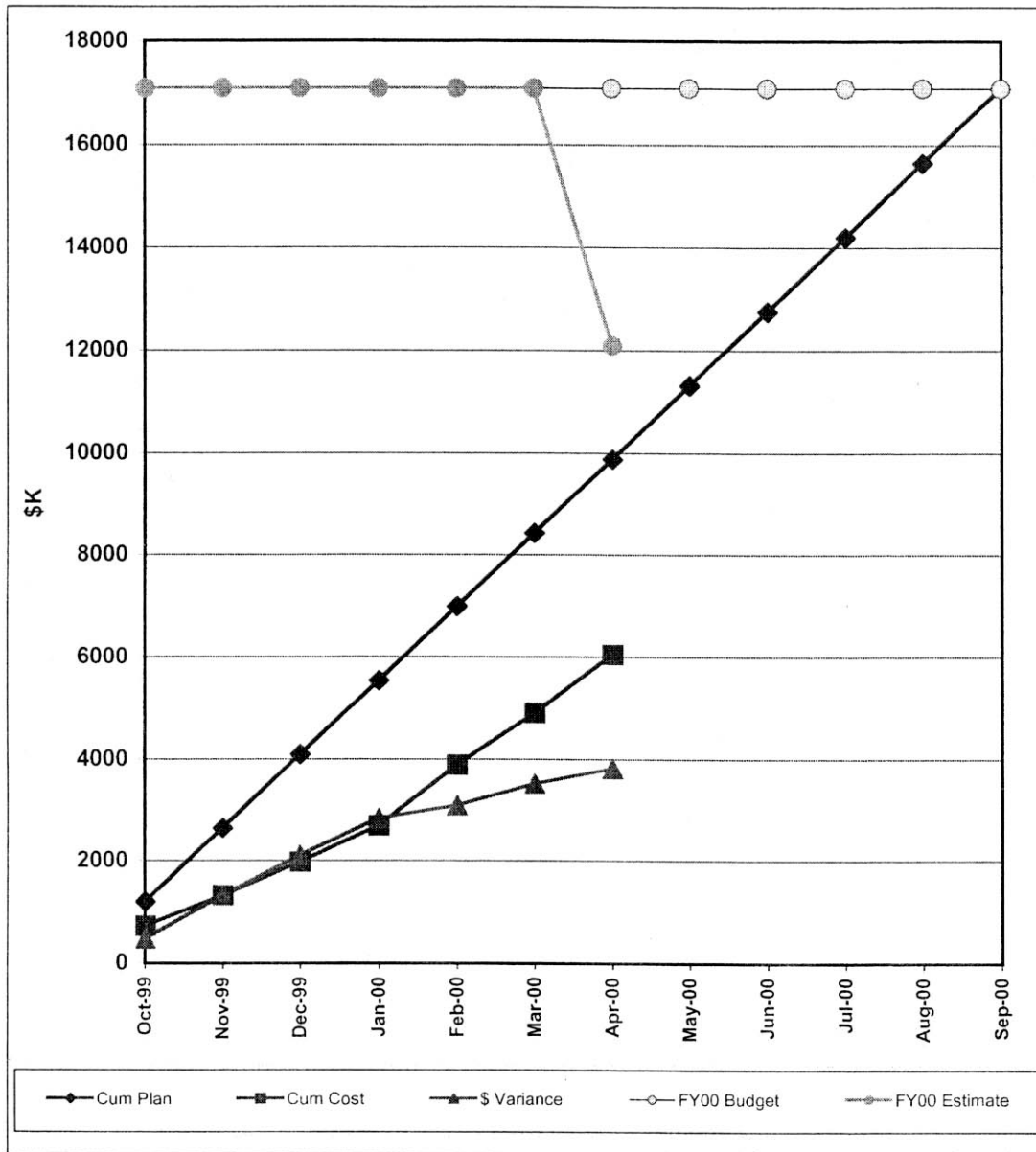
Month	Monthly		Cumulative				FY2000	FY2000
	Planned	Actual	Planned	Actual	\$ Var	% Var	Budget	Estimate
Oct-99	14,093 *	12,805	14,093 *	12,805	1,288	9%	38,008	38,008
Nov-99	2,174	2,246	16,267	15,050	1,217	7%	38,008	38,008
Dec-99	2,174	670	18,441	15,720	2,721	15%	38,008	38,008
Jan-00	2,174	1,496	20,615	17,216	3,399	16%	38,008	38,008
Feb-00	2,174	855	22,789	18,071	4,718	21%	38,008	38,008
Mar-00	2,174	1,091	24,964	19,162	5,802	23%	38,008	38,008
Apr-00	2,174	1,635	27,138	20,796	6,341	23%	38,008	38,008
May-00	2,174		29,312				38,008	
Jun-00	2,174		31,486				38,008	
Jul-00	2,174		33,660				38,008	
Aug-00	2,174		35,834				38,008	
Sep-00	2,174		38,008				38,008	

\* Includes \$6,252K of uncosted obligations from FY99.



**FY2000 Cost Plan to Actual  
as of April 2000  
WBS 1.9 - Operations Special Equipment (\$K)**

Project Number 96-D-111  
April 2000

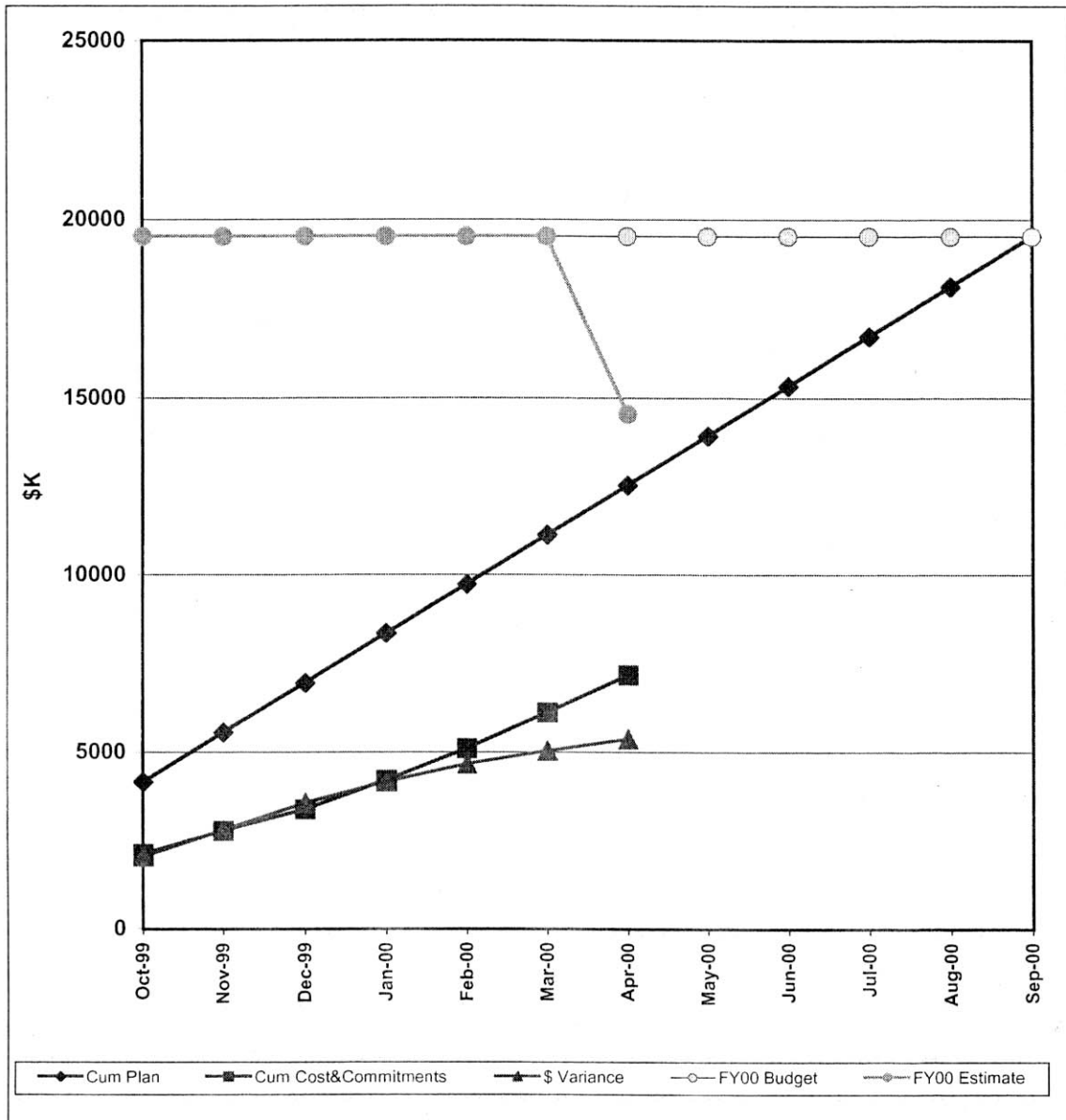


Month	Monthly		Cumulative				FY2000 Budget	FY2000 Estimate
	Planned	Actual	Planned	Actual	\$ Var	% Var		
Oct-99	1,209	728	1,209	728	481	40%	17,091	17,091
Nov-99	1,444	601	2,653	1,329	1,324	50%	17,091	17,091
Dec-99	1,444	653	4,097	1,982	2,115	52%	17,091	17,091
Jan-00	1,444	716	5,540	2,698	2,843	51%	17,091	17,091
Feb-00	1,444	1,191	6,984	3,889	3,095	44%	17,091	17,091
Mar-00	1,444	1,019	8,428	4,908	3,520	42%	17,091	17,091
Apr-00	1,444	1,142	9,872	6,050	3,822	39%	17,091	12,091
May-00	1,444		11,316				17,091	
Jun-00	1,444		12,759				17,091	
Jul-00	1,444		14,203				17,091	
Aug-00	1,444		15,647				17,091	
Sep-00	1,444		17,091				17,091	



**FY2000 Cost and Commitment Plan to Actual**  
**as of April 2000**  
**WBS 1.9 - Operations**  
**Special Equipment (\$K)**

Project Number 96-D-111  
 April 2000



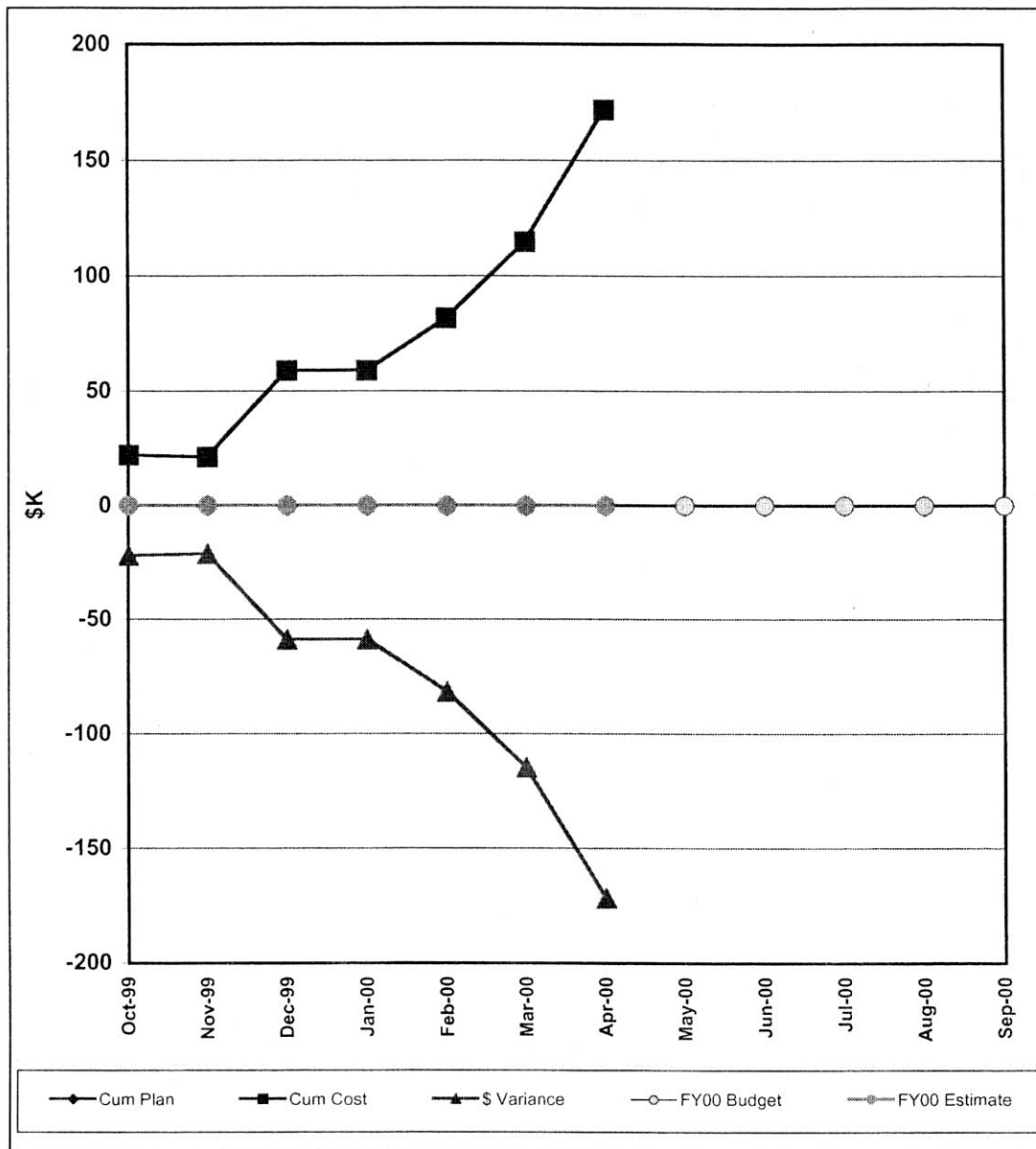
Month	Monthly		Cumulative				FY2000 Budget	FY2000 Estimate
	Planned	Actual	Planned	Actual	\$ Var	% Var		
Oct-99	4,144 *	2,102	4,144 *	2,102	2,042	49%	19,537	19,537
Nov-99	1,399	657	5,543	2,759	2,784	50%	19,537	19,537
Dec-99	1,399	618	6,943	3,377	3,566	51%	19,537	19,537
Jan-00	1,399	817	8,342	4,194	4,148	50%	19,537	19,537
Feb-00	1,399	894	9,742	5,088	4,654	48%	19,537	19,537
Mar-00	1,399	1,027	11,141	6,115	5,026	45%	19,537	19,537
Apr-00	1,399	1,059	12,540	7,174	5,367	43%	19,537	14,537
May-00	1,399		13,940				19,537	
Jun-00	1,399		15,339				19,537	
Jul-00	1,399		16,739				19,537	
Aug-00	1,399		18,138				19,537	
Sep-00	1,399		19,537				19,537	

\* Includes \$1,404K of uncosted obligations from FY99.



**FY2000 Cost Plan to Actual  
as of April 2000  
WBS 1.10 - Start-up Activities (\$K)**

Project Number 96-D-111  
April 2000



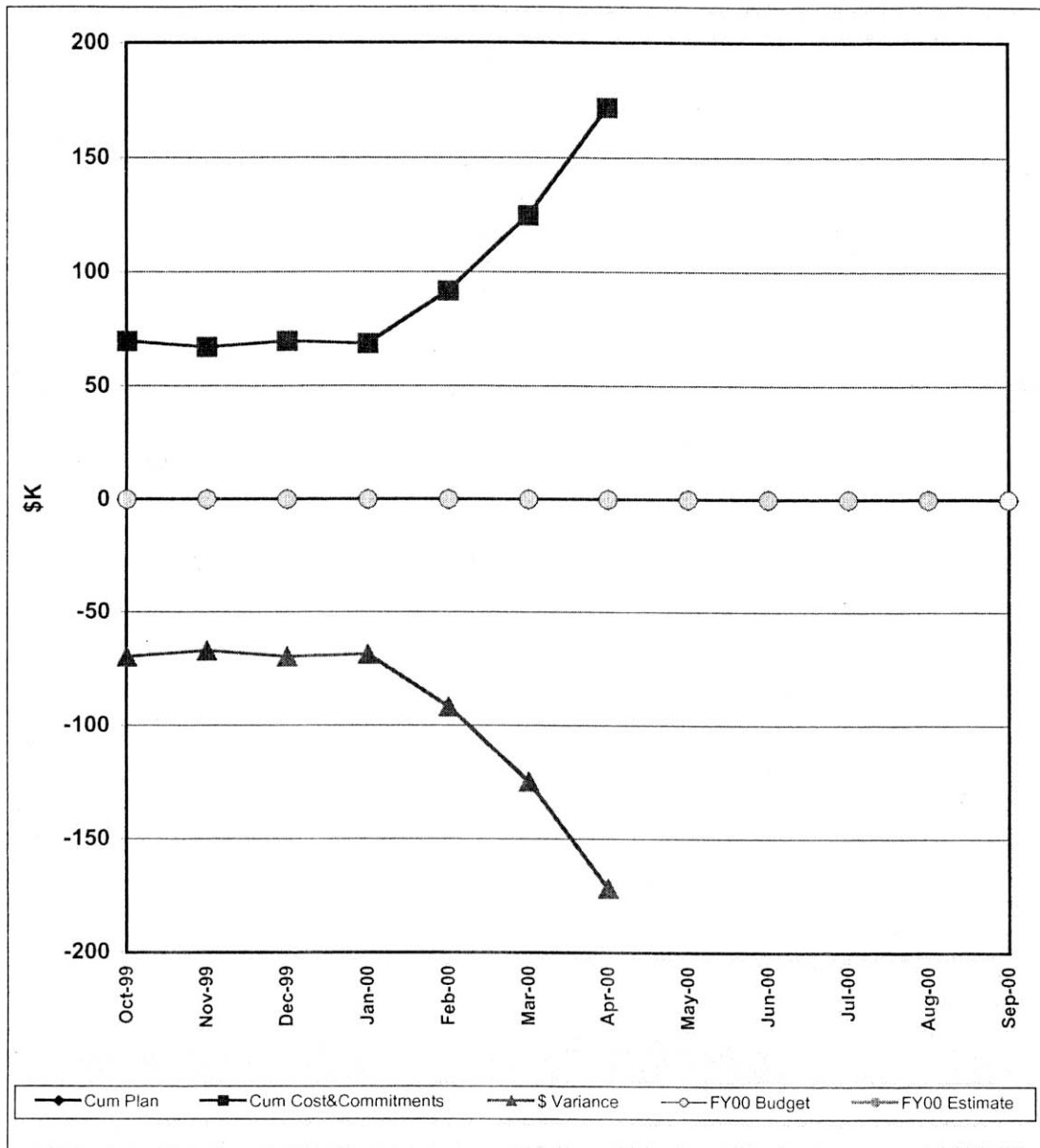
Month	Monthly		Cumulative				FY2000 Budget*	FY2000 Estimate
	Planned*	Actual	Planned	Actual	\$ Var	% Var		
Oct-99	0	22	0	22	-22	#DIV/0!	0	0
Nov-99	0	-1	0	21	-21	#DIV/0!	0	0
Dec-99	0	37	0	59	-59	#DIV/0!	0	0
Jan-00	0	0	0	59	-59	#DIV/0!	0	0
Feb-00	0	23	0	82	-82	#DIV/0!	0	0
Mar-00	0	33	0	115	-115	#DIV/0!	0	0
Apr-00	0	57	0	172	-172	#DIV/0!	0	0
May-00	0		0				0	
Jun-00	0		0				0	
Jul-00	0		0				0	
Aug-00	0		0				0	
Sep-00	0		0				0	

\* Plan will be prepared and budgeted.



**FY2000 Cost and Commitment Plan to Actual  
as of April 2000  
WBS 1.10 - Start-up Activities (\$K)**

Project Number 96-D-111  
April 2000



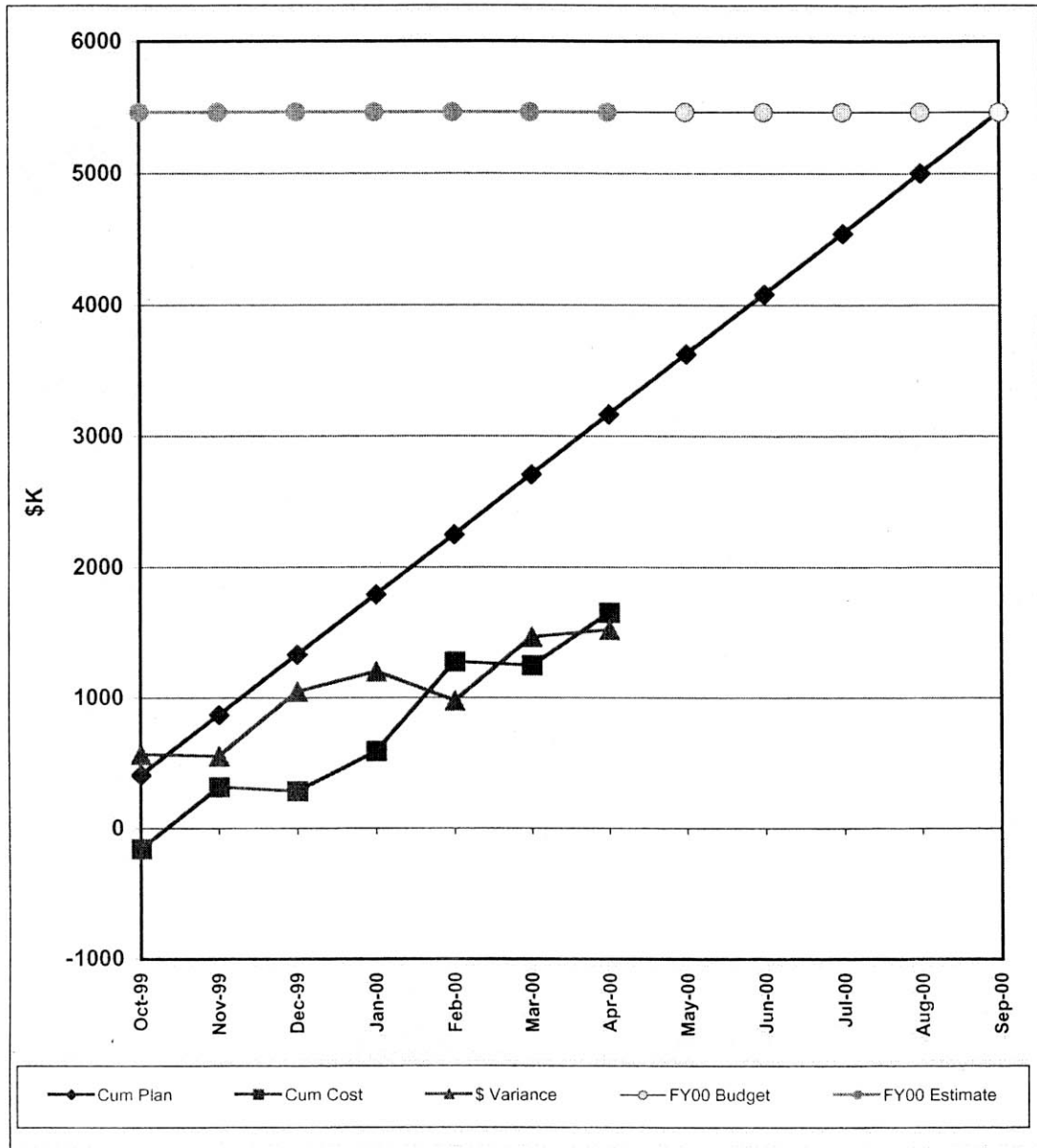
Month	Monthly		Cumulative				FY2000	FY2000
	Planned*	Actual	Planned	Actual	\$ Var	% Var	Budget*	Estimate
Oct-99	0	70	0	70	-70	#DIV/0!	0	0
Nov-99	0	-2	0	67	-67	#DIV/0!	0	0
Dec-99	0	3	0	70	-70	#DIV/0!	0	0
Jan-00	0	-1	0	69	-69	#DIV/0!	0	0
Feb-00	0	23	0	92	-92	#DIV/0!	0	0
Mar-00	0	33	0	125	-125	#DIV/0!	0	0
Apr-00	0	47	0	172	-172	#DIV/0!	0	0
May-00	0		0				0	
Jun-00	0		0				0	
Jul-00	0		0				0	
Aug-00	0		0				0	
Sep-00	0		0				0	

\* Plan will be prepared and budgeted.



**FY2000 Cost Plan to Actual  
as of April 2000  
WBS 1.11 (\$K)**

Project Number 96-D-111  
April 2000

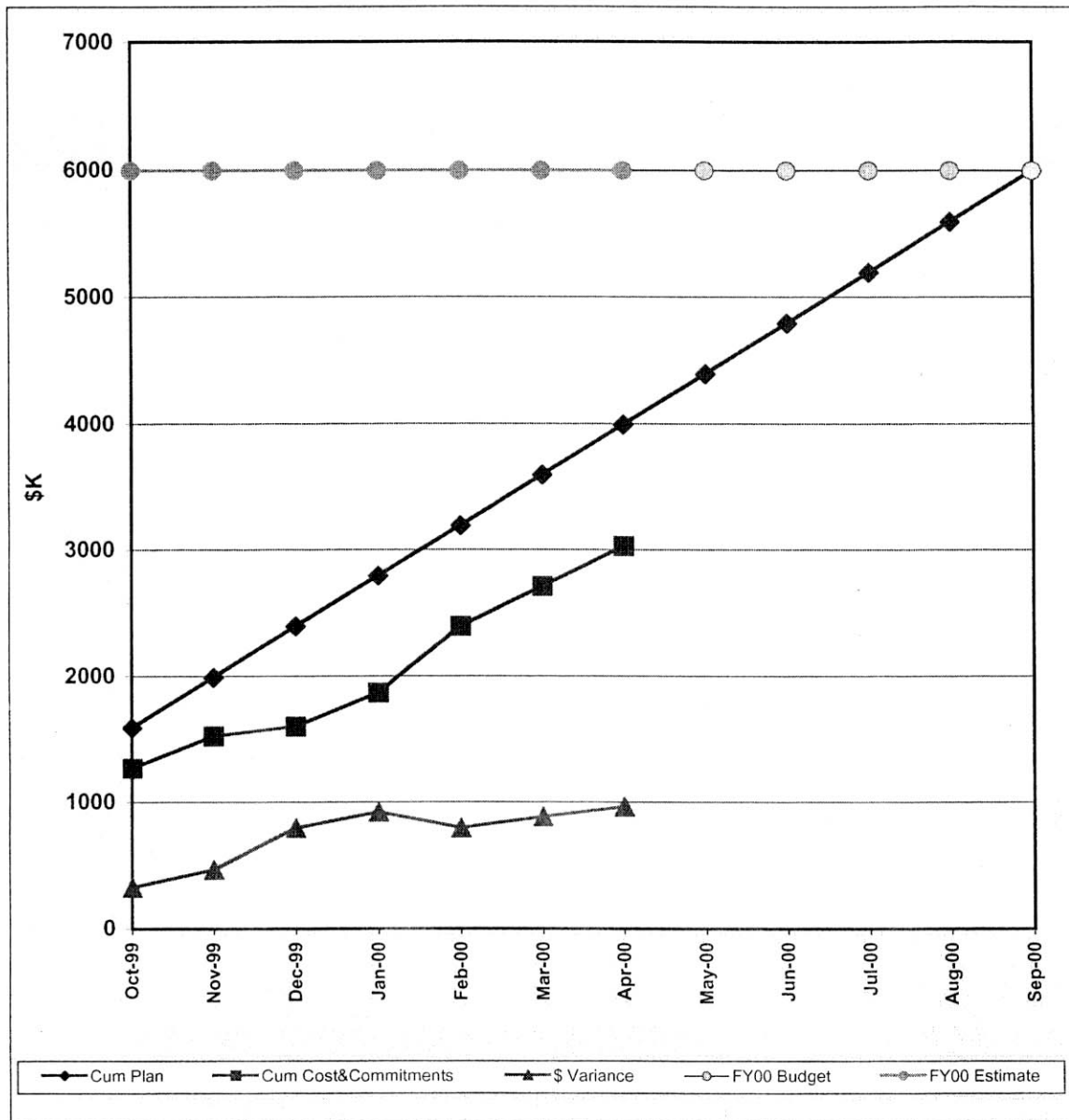


Month	Monthly		Cumulative				FY2000 Budget*	FY2000 Estimate
	Planned*	Actual	Planned	Actual	\$ Var	% Var		
Oct-99	410	-157	410	-157	567	138%	5,466	5,466
Nov-99	460	474	870	317	553	64%	5,466	5,466
Dec-99	460	-33	1,329	284	1,046	79%	5,466	5,466
Jan-00	460	306	1,789	589	1,200	67%	5,466	5,466
Feb-00	460	682	2,248	1,272	977	43%	5,466	5,466
Mar-00	460	-29	2,708	1,243	1,465	54%	5,466	5,466
Apr-00	460	406	3,168	1,649	1,519	48%	5,466	5,466
May-00	460		3,627				5,466	
Jun-00	460		4,087				5,466	
Jul-00	460		4,546				5,466	
Aug-00	460		5,006				5,466	
Sep-00	460		5,466				5,466	



**FY2000 Cost and Commitment Plan to Actual**  
**as of April 2000**  
**WBS 1.11 (\$K)**

Project Number 96-D-111  
 April 2000



Month	Monthly		Cumulative				FY2000 Budget	FY2000 Estimate
	Planned	Actual	Planned	Actual	\$ Var	% Var		
Oct-99	1,592	1,269	1,592	1,269	323	20%	5,993	5,993
Nov-99	400	256	1,992	1,525	467	23%	5,993	5,993
Dec-99	400	73	2,392	1,598	794	33%	5,993	5,993
Jan-00	400	271	2,792	1,869	923	33%	5,993	5,993
Feb-00	400	526	3,192	2,396	797	25%	5,993	5,993
Mar-00	400	312	3,593	2,708	885	25%	5,993	5,993
Apr-00	400	322	3,993	3,030	963	24%	5,993	5,993
May-00	400		4,393				5,993	
Jun-00	400		4,793				5,993	
Jul-00	400		5,193				5,993	
Aug-00	400		5,593				5,993	
Sep-00	400		5,993				5,993	

\* includes \$1,423K of uncosted obligations from FY99.



## FY00 NIF Contingency Log - April 00 (\$BA)

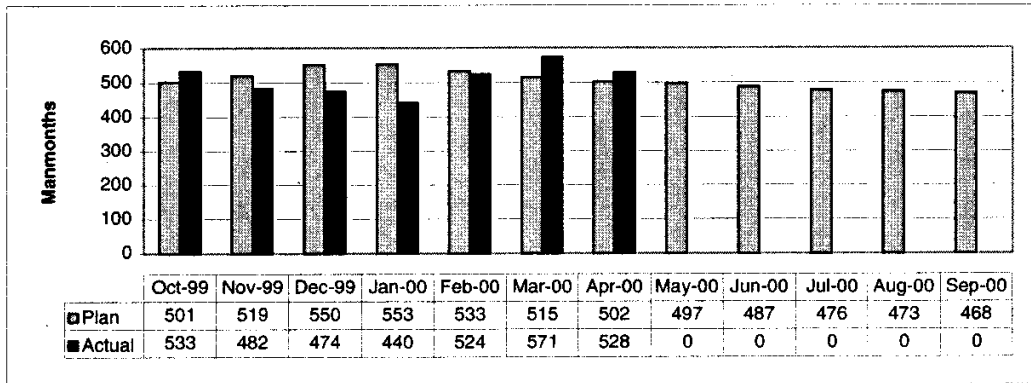
Month	Request #	WBS element	Total	Contingency
Oct-99	BCP00-002	1.2.2.1	\$ 725,200	\$ 29,948,388
	CTR319	1.8.7	\$ 65,000	\$ 29,883,388
	CTR323	1.2.2.4.9	\$ 185,000	\$ 29,698,388
	ECR1072	1.4.1	\$ 26,800	\$ 29,671,588
	ECR1120	1.4.1.3	\$ 28,800	\$ 29,642,788
		1.4.3.2	\$ 67,200	\$ 29,575,588
	ECR1124	1.3.2.6	\$ 3,700	\$ 29,571,888
	ECR410	1.4.1.2	\$ 468,000	\$ 29,103,888
Nov-99		1.4.4.1	\$ (683,200)	\$ 29,787,088
	BCP00-005	1.3.4	\$ (1,812,000)	\$ 31,599,088
	BCP00-007	1.2.2.1	\$ 100,000	\$ 31,499,088
		1.2.2.4.9	\$ 1,200,000	\$ 30,299,088
	BCP00-008	1.3.2	\$ 846,000	\$ 29,453,088
	BCP00-009	1.3.2	\$ 2,389,600	\$ 27,063,488
	CTR324	1.2.2.4.6	\$ 100,000	\$ 26,963,488
	CTR325	1.2.2.4.4	\$ 76,000	\$ 26,887,488
	CTR327	1.3.2	\$ 195,000	\$ 26,692,488
	CTR328	1.2.2.4.6	\$ 118,000	\$ 26,574,488
	CTR330	1.4.3.1	\$ 375,000	\$ 26,199,488
	CTR331	1.2.2.4.9	\$ 198,000	\$ 26,001,488
	ECR1166	1.9.2	\$ 5,000	\$ 25,996,488
Dec-99	BCP00-010	1.4.5.1	\$ 800,000	\$ 25,196,488
	CTR332	1.2.2.4.9	\$ 250,000	\$ 24,946,488
	CTR336	1.2.2.4.6	\$ 156,000	\$ 24,790,488
	CTR338	1.2.2.4.5	\$ 108,000	\$ 24,682,488
	CTR340	1.2.2.4.6	\$ 133,000	\$ 24,549,488
	ECR1275	1.4.4	\$ 250,000	\$ 24,299,488
		1.8.4	\$ 250,000	\$ 24,049,488
Jan-00	BCP00-004	1.1.5	\$ 362,500	\$ 23,686,988
		1.4.1.2	\$ 100,000	\$ 23,586,988
		1.5.4.1	\$ 10,000	\$ 23,576,988
		1.7.1.4	\$ 95,000	\$ 23,481,988
	BCP00-006	1.4.2.4	\$ 609,000	\$ 22,872,988
	CTR344	1.4.4.2	\$ 311,000	\$ 22,561,988
	ECR1316	1.2.2.1	\$ 20,000	\$ 22,541,988
		1.2.2.4.9	\$ 15,000	\$ 22,526,988
	ECR1356	1.4.1.3	\$ 69,300	\$ 22,457,688
	ECR1357	1.4.1.3	\$ 94,900	\$ 22,362,788
Feb-00	BCP00-011	1.4.3.2	\$ 2,600,000	\$ 19,762,788
	CTR335	1.1.4	\$ 185,000	\$ 19,577,788
	CTR337	1.2.2.4.5	\$ 400,000	\$ 19,177,788
	CTR343	1.2.2.4.6	\$ 250,000	\$ 18,927,788
	CTR345	1.2.2.4.9	\$ 88,000	\$ 18,839,788
	CTR346	1.2.2.1	\$ 125,000	\$ 18,714,788
	CTR349	1.2.2.4.6	\$ 450,000	\$ 18,264,788
	CTR350	1.2.2.4	\$ 302,000	\$ 17,962,788
	ECR1408	1.4.4.3	\$ 50,000	\$ 17,912,788
Mar-00	CTR351	1.2.2.4.9	\$ 145,000	\$ 17,767,788
	CTR353	1.3.1.3	\$ 375,000	\$ 17,392,788
	ECR1437	1.8.7	\$ 100,000	\$ 17,292,788
	ECR1473	1.4.2.4	\$ 170,000	\$ 17,122,788
	ECR1515	1.4.4.2	\$ 5,700	\$ 17,117,088
	ECR1535	1.1.5	\$ 54,000	\$ 17,063,088
	ECR1554	1.4.1	\$ 55,000	\$ 17,008,088
		1.6.10.1	\$ 50,000	\$ 16,958,088
Apr-00		1.7.1	\$ 25,000	\$ 16,933,088
	CTR354	1.8.7	\$ 66,000	\$ 16,867,088
	ECR1439	1.4.3.2	\$ 75,000	\$ 16,792,088
	ECR1517	1.1.5.6	\$ 40,500	\$ 16,751,588
		1.2.2.4.9	\$ 4,000	\$ 16,747,588
		1.4.6.2.4	\$ 43,500	\$ 16,704,088

\* Month end balance reduced a net of \$396K due to reinstatement of CTR337 and deletion of ECR1364.



# DRAFT

## FY00 - Manpower Plan to Actual by Month\* as of April 2000 (LLNL and Supplemental Labor Manmonths)



\* FY00 manpower plan will be in draft until the rebaselining effort is complete and the FY00 Cost Account Plans are approved.